

BROOKLYN BOTANIC GARDEN

PLANTS
&
GARDENS

PLANTS & GARDENS

Spring, 1949

Rhododendrons and Azaleas

Distribution

Propagation and Culture

Garden Uses

Pests

—

In a Home Greenhouse

—

Spring Work

on

Roses and Chrysanthemums



AMONG THE CONTRIBUTORS TO THIS ISSUE

- FERRIS S. BATSON, Professor of Ornamental Horticulture, Mississippi State College, State College, Mississippi.
- PAUL R. BOSLEY of The Bosley Nurseries, Mentor, Ohio, specializes in Rhododendrons, Azaleas, Hollies, and Roses.
- CLEMENT G. BOWERS, author of "Rhododendrons and Azaleas," the most complete book on the subject published in the United States; Research Associate in Botany at Cornell University, Ithaca, New York; and Lecturer in Botany at Triple Cities College of Syracuse University.
- ALICE DUSTAN of Morristown, New Jersey, a writer and lecturer on garden subjects, and formerly Garden Editor of "House Beautiful Magazine."
- SAMUEL A. EVERITT, an executive for thirty-five years in the New York publishing field, who has kept in constant touch with the soil through his interest in the cultivation of attractive plants.
- WILLIAM FLEMER, III, Chief Propagator and Vice-president of the Princeton Nurseries, Princeton, New Jersey.
- HENRY J. HOHMAN of Kingsville Nurseries, Kingsville, Maryland, interested in the growing of the newer ornamental plants.
- HERBERT G. IHRIG, an enthusiastic Rhododendron grower, active in developing the collections at the University of Washington Arboretum.
- A. H. MACANDREWS, Professor of Forest Entomology at New York State College of Forestry, Syracuse University, Syracuse, New York, and Councilor of District 2 of the American Rose Society.
- B. Y. MORRISON, Principal Horticulturist In Charge of the Division of Plant Exploration and Introduction of the United States Department of Agriculture. Acting Director of the National Arboretum, and Editor of The National Horticultural Magazine.
- SOPHIA and ROBERT E. NAUMBURG, enthusiastic home gardeners of West Englewood, New Jersey. Mr. Naumburg is President of the Federated Garden Clubs of Bergen County, New Jersey, and an active member of the Men's Garden Club of New York City. Mrs. Naumburg is author of the recent booklet, "The Trick of Making your own Corsages."
- JOHN C. PARKER, Vice-president in charge of special problems, Consolidated Edison Company, New York, an amateur horticulturist with a special enthusiasm for Azaleas and Rhododendrons.
- ERNEST L. SCOTT, a retired professor at Columbia University, New York City, Editor of the Bulletin of The National Chrysanthemum Society, and (together with Mrs. Scott) author of "Chrysanthemums for Pleasure."
- HENRY T. SKINNER, Curator of the Morris Arboretum, University of Pennsylvania, Philadelphia, Pennsylvania.
- CYNTHIA WESTCOTT, professional plant pathologist, garden consultant, and author of several garden books, including "The Gardener's Bug Book."

PLANTS & GARDENS



Tulipa Batalinii

Vol. 5

Spring, 1949

No. 1

CONTENTS

Cover—Rhododendron Cunningham's White (McFarland photo)

Among the Contributors to this Issue Page 2 of Cover

Frontispiece Rhododendrons at the Brooklyn Botanic Garden 2

Director's Letter 3

Articles of General Interest

In a Home Greenhouse Sophia and Robert E. Naumburg 4

Spring Care in the Rose Garden A. H. MacAndrews 6

Spring Propagation of Chrysanthemums Ernest L. Scott 10

Articles on Rhododendrons and Azaleas

Propagation of Rhododendrons and Azaleas Henry T. Skinner 13

Distribution and Classification of Rhododendrons Clement Gray Bowers 18

Culture of Rhododendrons and Azaleas H. J. Hohman 24

Mycorrhiza in Members of the Heath Family William Flemer, III 29

Rhododendron Culture in the Pacific Northwest Herbert G. Ihrig 31

Fundamentals of the Culture of Rhododendrons and Azaleas Paul R. Bosley 33

Azalea Culture in the South Ferris S. Batson 35

How to Force Azaleas in the Home Greenhouse Conrad B. Link 38

Low-growing Companions for Azaleas and Rhododendrons 40

Rhododendrons and Azaleas in the Garden Alice L. Dustan 45

Naturalized Rhododendrons John C. Parker 50

Dexter Hybrid Rhododendrons Samuel A. Everitt 55

The Glenn Dale Hybrid Azaleas B. Y. Morrison 58

Pests and Diseases of Rhododendrons and Azaleas Cynthia Westcott 60

Within the Brooklyn Botanic Garden 64

Drawings by Michalena L. Carroll

CONRAD B. LINK, *Guest Editor*

MICHALENA L. CARROLL AND HESTER M. RUSK, *Assistant Editors*

Published quarterly at Prince and Lemon Streets, Lancaster, Pa., by the Brooklyn Botanic Garden, Brooklyn, N. Y.
Entered as second-class matter, May 26, 1945, at the post-office at Lancaster, Pa., under Act of August 24, 1912
Subscription included in Botanic Garden membership dues. To others: \$2.00 per year; \$3.50 for two years

Copyright, 1949, by the Brooklyn Botanic Garden

ALL CORRESPONDENCE SHOULD BE ADDRESSED TO:
BROOKLYN BOTANIC GARDEN, BROOKLYN 25, N. Y.



THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES
BROOKLYN BOTANIC GARDEN
1000 WASHINGTON AVENUE
BROOKLYN 25, NEW YORK
TELEPHONE: MAIN 2-4433

Spring 1949

ABOUT PLANTS & GARDENS:

Guest-Editor for this issue is Conrad B. Link, Professor of Floriculture at the University of Maryland, formerly Horticulturist at the Brooklyn Botanic Garden. Dr. Link has brought our readers a fine group of articles featuring Rhododendrons. Every author has had long experience with these unusually interesting plants.

Hundreds of kinds of Rhododendrons and Azaleas grow wild somewhere on the earth, and nearly all of these are found in the northern half of the world. Of the numerous wild types known to science, only a few are commonly cultivated. It is from these that the varieties usually available from nurserymen today have been selected and hybridized. For those of you who have not already made the happy discovery, there are Rhododendrons in your future!

The summer issue will feature Lilies. Our Guest-Editor is Mr. George L. Slate, of the Agricultural Experiment Station (Cornell University), Geneva, New York.

SPECIAL MESSAGE FOR MEMBERS OF THE BROOKLYN BOTANIC GARDEN:

Save the date, May 17th. Members of the Botanic Garden who live in and around New York will be interested in a tour of Long Island estates. It is to be an all-day affair for Members and their guests. For details see page 64.

Sincerely yours,



Director

←

Rhododendrons at the Brooklyn Botanic Garden

Except where otherwise credited, photographs by Louis Buhle

IN A HOME GREENHOUSE

Preview of spring

Sophia and
Robert E. Naumburg

EARLY spring is the highlight in a greenhouse gardener's life. The pulse of growing beauty is strong and vibrant. With a little knowledge and proper encouragement, it is possible to create a vista of loveliness, while all is bleak and barren just outside the window.

Glance at the accompanying photograph, and try to imagine that you have just stepped from out of the breakfast nook into our "House of Flowers." Here our gardener-of-the-future is helping to tend the greenhouse plants.

Color

At the center of the room, in the place of honor, is the old "Jade Plant" (*Cras-sula argentea*). Just above, on the bench, in its full glory of brilliant orange, is the Kafir-Lily (*Clivia miniata*). Alongside of it is an Echeveria, and behind is a Kurume Azalea, a bicolor, pink and white. Further back, and barely visible in this picture, are two standard Geraniums, a red one and a white one. Visible in the left side of the picture is a tender fibrous-rooted Iris, which blooms each year on the same stalk. A potted young Orange tree may be seen above the Iris. Higher still, in the left foreground, is a standard Lantana. Golden Queen is most prolific, seldom being without blossoms or buds. It is kept on the dry side over the summer, and is a bower of gold during the fall and winter. It receives a strong pruning in the spring, when cuttings are taken from it for the outside garden.

Begonias are also evident in the picture. Beefsteak Begonia (*Begonia*

Feastii), whose leaves resemble those of a Pond-Lily, also *Begonia Feastii Bunchii*, whose leaves are crested and frilled, have sprays of rose-pink flowers of a dainty, airy quality. These both belong to the rhizomatous Begonia group.

There are many other interesting and sweet-smelling plants that do not show in this photograph. Two varieties of Amaryllis (*Hippeastrum*) are still adding a strong note of color to the scene: Mont Blanc, a pure sparkling white, and Madame Curie, a clear salmon. The Amaryllis' dependability of bloom is one of the main props for a greenhouse.

Fragrance

The rich, velvety odor of Easter Lilies assails the nostrils. Mingled with their fragrance is an equally strong perfume, that of Hyacinths: L'Innocence, white, and Jan Bos, a brilliant red variety with a white center. Pots of Twink, a double, clear orange Daffodil, are interspersed with Red Champion Parrot Tulips.

A large bush of "Sweet Olive" (*Osmanthus fragrans*) is fragrantly blooming in the sunniest corner of the greenhouse. On the bench, a large plant of Crown-of-thorns (*Euphorbia splendens*) is still flowering, and will continue to do so until it is put outdoors for the summer.

At the extreme right, in the foreground, may be seen some of the branches of our Ponderosa Lemon tree, with lemons as large as grape-fruits. Along the two side shelves are Cacti and succulents. One of our favorites is *Stapelia gigantea*, "modestly" hiding the beauty of its reddish-brown striped flowers.

Vines

Over the entrance, but not shown in this picture, are two rampant vines, "contending for supremacy." Both are set in the ground, to give the roots unlimited



Harry photo

Gardener-of-the-future in the authors' greenhouse

room for growth. On the left of the doorway is the Passion-flower vine (*Passiflora caerulea*). This clinging vine blooms in spring and summer, and thrives on large doses of liquid manure. It will completely choke any plant within its reach. The curled tendrils of this vine "grasp for support" on any object in its path. The beauty of its flowers, however, is worth all the time spent in curbing its "taking ways." Passion-flowers are without equal for corsage material. In its natural state, growing in the open in the tropics, the vine bears fruit.

The vine on the other side of the entrance is the carmine Bougainvillea. Although it is not so destructive as the Passion-flower vine, having no curling tendrils, it is almost as strong-growing. Its flowers are also beautiful, but entirely different. It blooms earlier than the other vine, from about Christmas time until summer. Its bloom is similar to that of Poinsettia, in that the so-called petals are bracts [leaves in a flower cluster]. The true flowers are the inconspicuous center. The main difference between the flowering habits of the two vines is that the Bougainvillea is a mass of color on the tips of all of the branches, while the Passion-flower vine has only a few flowers a day on the stem, beginning at the bottom and gradually working out to

the tips. There are some Passion-flowers open almost every day during the blooming season.

Propagation

Close to the roof of the greenhouse you may observe flats on a hanging platform. The reason for this location is to obtain, for the young seedlings or cuttings, as much warmth and sunlight as possible. The soil is sterilized, and the seedlings are watered with a solution of potassium nitrate, one teaspoon to a gallon of water. This solution is used to encourage root growth. For cuttings, sterilized sand is used as a rooting medium. A hormone powder, such as Rootone, is used on the slips. Many cuttings are made of plants that are growing too large for the greenhouse. New plants are also started from large, old plants for outdoor garden use. More and better blossoms may be expected from vigorous young growth, than from exhausted old plants.

The greenhouse affords ideal conditions to start new and rare kinds of plants from seed, for both the greenhouse and the outdoor garden. The fun comes from experimenting with varieties that are seldom raised by local growers. This link with the great outdoors is a true preview of spring!

SPRING CARE IN THE ROSE GARDEN

What is really necessary

A. H. MacAndrews

THE first warm days of spring are like a tonic, and it is difficult to restrain the urge to start work in the Rose garden; but the cautious and experienced rosarian does not fall into the first seasonal trap that might result in premature unhillings.

In northern latitudes, the spring is a difficult period for vegetation. It brings a wide range of fluctuating temperatures from week to week, and long periods of unseasonable weather that may either accelerate or retard growth. One season may be several days or weeks early, and the next season late. It is better to use the nature of the season as an indicator of when to unhill than blindly to follow calendar dates. A diary of garden chores

is helpful; but it should be used only as a general guide.

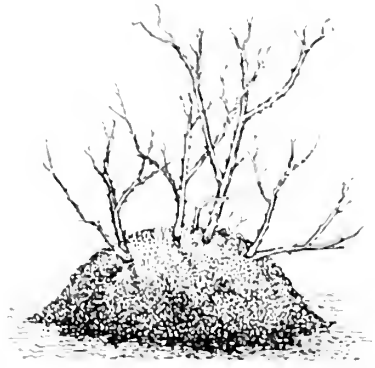
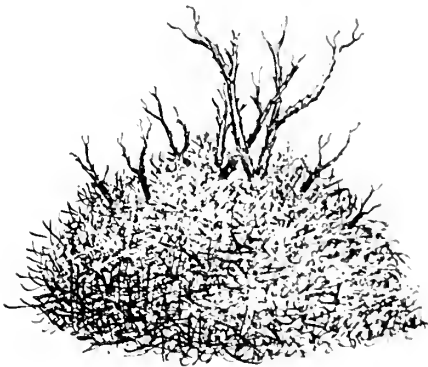
Uncovering

The first spring chore in the Rose garden is to remove any straw or evergreen covering that has been used on the Rose hills. Otherwise, the early spring activity of mice, under the protection of this covering, may result in damage to the canes. After the covering is removed, the old diseased Rose leaves that have dropped to the ground during the winter should be carefully picked up and burned. They accumulate in quantities in the depressions between the hills and in windrows along the edges of the beds, apparently just waiting for an opportunity to infect the new foliage with black spot. Failure to dispose of this trash leads to disease troubles later in the growing season; and yet many Rose growers overlook this source of infection, and stir the old leaves into the soil as they unhill. A clean bed in early spring is quite essential to good Rose growing.

Unhilling

The question of when to unhill is a much more serious problem than the fall question of when to hill up. No positive statement can be made as to when to unhill; the time varies with the section of the country and with the season.

Rose bush with winter protection: hilled up and covered with straw



Rose bush with straw covering removed

Some growers advocate postponing the unhilling until all danger of late frosts is over. In many sections of the country, however, this is not advisable, because frosts often come in late May and June, and growth would be well advanced within the hill by that time. Removal of the hill so late would bring grave danger of breaking off the soft tender shoots; and subsequent exposure to sun and wind would result in injury to this advanced growth.

After the weather has become settled, and the ground no longer crusts over at night, it is time to think about unhilling. In northern areas this is about mid-April to early May; and though light snows and frosts may occur after this unhilling, they need not result in damage. The growth that develops after a plant has been unhilled is much more frost resistant than the growth present at the time of uncovering; and if the unhilling can be done during a mild, dull spell, the growth already developed may harden in time to resist ensuing frosts.

Care should be taken, in removing the hill, to prevent injury to the stems, old or new. The bed should be brought to the level of previous years. If soil has been hauled in for hilling up in the fall, it will be necessary to haul it away. Otherwise the level of the bed will gradually be built up; and soon the bud or

graft will be many inches below the surface.

Most Rose beds benefit by the yearly addition of organic matter. If old manure has been used in the depressions between the hills, this can be worked into the bed as it is leveled off. Manure usually breaks down to such an extent that it does not materially raise the level of the bed when it is worked in. Either manure or peat-moss improves the physical condition of the soil, and increases its water-holding capacity. Manure also introduces bacteria that help to make the food materials more readily available; but it often creates weed problems. Peat-moss does not bring either helpful bacteria or troublesome weed seeds, and it is certainly much nicer to handle.

Topping

Usually the tops of the old canes die back. The extent of the dieback depends on the climate and the variety of Rose. In some cold regions, the tips of the canes are killed back to the top of the hill; but in milder sections, portions of the canes, above the hill, may be green and healthy

in the spring. A common question is how short to cut the canes. The answer is to cut off the dead top just above a live bud, even though this may produce canes of uneven length. Do not cut all of the canes back to a uniform length of 3 or 4 inches. This old practice of slashing the tops back to mere stubs is no longer approved.

Pruning

Much can be done to rejuvenate a plant and reshape it, by careful and proper pruning. At the time of topping, all weak and spindly canes should be removed; they do not produce husky offsets and laterals; and cutting them out encourages new buds to break at the base and send up stronger growths. Canes broken by winter snow and ice should be cut off cleanly to the nearest bud. A tall spindly bush can be induced to spread out, if all canes are cut back to outside buds; while a sprawling bush can be encouraged to assume a more upright habit, if it is cut back to buds pointing inwards and upwards. But many rosarians are too busy to take the time for thus improving the shape of their bushes.

Digging organic matter into the Rose bed



Protection against Diseases

The practice of painting the stubs is another time-consuming job that is not necessary. It is unfortunate that many people stress the need of such details for successful Rose growing. These chores take all the fun out of gardening; and a novice grower soon gets discouraged and comes to the conclusion that Roses are too difficult to grow.

There is no scientific evidence to support the common practice of spraying the ground around the Rose bushes with a dormant spray for the control of black spot after the hills have been removed. This is another of those unnecessary jobs that are often recommended without reservation. Black spot and mildew live over winter in the old leaves on the ground, but do not live in the soil; there is no object in spraying the soil for an organism that is not in the soil. Destroying all the old leaves (as was recommended before) removes the major cause of the early spring infection by black spot, and does away with any need of treating or removing the soil.

As prevention is much better than control, it is wise to begin applying fungicides and insecticides in May and early June, so that the foliage is clean when the Roses are at their peak. If the applications are delayed until late June, the fight will be to control black spot instead of preventing it.

Replacements

It takes just as much time and effort to look after a weak plant as a strong healthy one, and there is very little return for the effort. All dead plants and all those with very weak canes should be removed. The old soil should be taken out, too, and the hole filled with fresh soil from another bed, with about a third of peat-moss mixed in. If a new plant is put in, it should be planted with the bud or graft a little below the surface of the soil; it should be hilled up until it

becomes established and the bark of the stem properly hardened. In spite of recent recommendations to place the bud above the ground line, I still favor placing it below ground in cold climates. Too many rosarians procrastinate in hilling up in the fall; and sudden premature cold spells often catch them unprepared and their plants unprotected. Overnight the temperature may drop well below freezing and the ground freeze hard. Hilling up is then impossible, and so the Roses go through the winter unprotected (unless a blanket of snow comes). The losses are likely to be high if the bud or point of graft is above the soil line. If, on the other hand, the bud is below the soil line, the wood above ground may die in a severe winter, but fresh growth will start from the stub below the ground. The high planting may be all right for the milder sections of the country, but in the colder areas it invites trouble.

Fertilizer

After the new growth has started, it is time to think about the first application of fertilizer. The choice of fertilizer is often a personal matter, based on experience and the needs of the soil. If you are not getting the proper top growth, put the emphasis on nitrogen. If your blossoms are soft, with weak necks, and the canes are weak, increase the potash. I prefer to use a commercial fertilizer of 5-10-10, as my soil needs the extra potash. If your soil is low in nitrogen, you should use a commercial fertilizer with more than 5 parts of nitrogen. You can get practically any combination you want—but don't overdo the feeding. A handful of fertilizer to a plant, scattered over the surface of the ground and scratched or hoed in, is enough to give the plants the necessary help for the big burst of bloom in June.

Following a routine such as this should give strong healthy Roses through the long summer months. A great deal depends on the proper start in the spring.

SPRING PROPAGATION OF CHRYSANTHEMUMS

*By cuttings—best—or by
divisions*

Ernest L. Scott

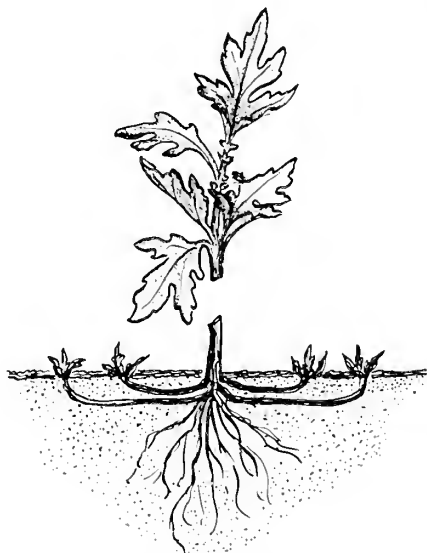
CHRYSANTHEMUMS that are grown to single-stemmed plants give more and better bloom than those left in undivided clumps from the preceding year. Furthermore, commercial growers and professional gardeners, as well as critical amateurs, propagate exclusively from rooted cuttings rather than from divisions.

Cuttings

The reason for the preference for rooted cuttings is threefold. (1) Many more plants can be secured from a given number of stock plants. (2) The cuttings can be timed so that they are ready to set in accordance with any planting schedule; for example, if the plants have been wintered in a cold frame, the stock can be forced into early growth so that the shoots will be of sufficient length to afford cuttings when they are wanted. (3) Most important, however—when the cuttings are taken properly, they develop into plants that are stronger and more free of disease than those produced by any other method of propagation.

As a precaution against carrying disease over from the stock plants, cuttings should be taken only from strong shoots that are 6 to 8 inches tall. The stock plants should be sprayed or dusted at rather short intervals (not over 10 days) with ferimate and sulfur; and some sort of protection against splash should be ensured. Nematodes, and Septoria leaf-spot infections, may come from soil that is splashed on the leaves by rain or by careless watering.

Cuttings should be taken about five weeks before it is desired to set the plants

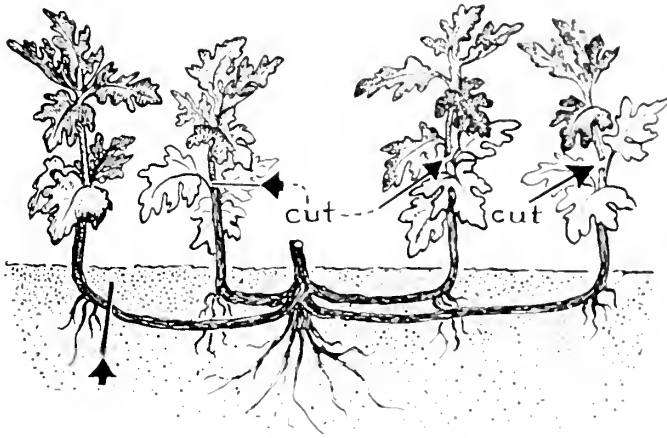


Chrysanthemum stock plant in the fall, with old stem removed

in the open ground. This period allows three weeks for rooting, and two weeks in 2½-inch pots or plant bands.

There is nothing occult about making Chrysanthemum cuttings. A piece 2½ or 3 inches long is taken from the tip of a strong shoot. The cut should be made with a razor-sharp knife, straight across, and about ¼ inch below a leaf. The straight cut is more likely to give a uniformly strong clump of roots, all around the stem; whereas only a few stringy ones may result from a diagonal cut. About an inch (not more) at the base of the stem is freed of leaves by cutting the petioles, not by stripping the leaves. The remaining leaves are left intact, for they are needed to make food for root formation.

The prepared cutting is submerged in a bath prepared by adding 6 or 8 drops of 40 per cent nicotine sulfate and about



Chrysanthemum stock plant in the spring. Left arrow indicates where to take a division. Remaining arrows show where to take cuttings

$\frac{1}{4}$ teaspoonful of fermate to a quart of water. The fermate must first be made into a thick paste (by adding water a few drops at a time) and then into a thin slurry, before being added to the main body of water. The nicotine sulfate assures rooted cuttings free of aphids, and the fermate helps in protecting against disease. Both seem to aid rather than to hinder rooting.

After removal from the bath, the cuttings are treated with a rooting hormone, according to the manufacturer's directions.

The cuttings are then set in the rooting medium. We, ourselves, use clean builder's sand, fresh from the pit, without sterilization. From $\frac{1}{2}$ to 1 inch of the stem is inserted in the sand, and thoroughly firmed in place. The sand may be in small containers such as bulb pans, or flats 3 to 4 inches deep, or in a cutting bench in a greenhouse. The pans or flats may be set in a cold frame or in a greenhouse bench; or the bulb pans, of course, may be placed on a window sill in the house. Other recommended rooting media are vermiculite, and a mixture of half sand and half peat-moss.

It now remains only to keep the rooting medium wet, and to shade the cuttings

with muslin or newspapers if this is necessary to prevent wilting. So long as there is no wilting, the more light the better.

The time required for rooting depends partly on the condition of the stems when the cuttings are taken, and partly on the variety, but largely on the temperature. When all conditions are optimum, we usually have the cuttings ready for potting in ten or twelve days. Cuttings placed in a cold frame in late April or early May require about three weeks to root.

When the roots are $\frac{1}{2}$ inch long, the cuttings are ready to go into small pots, plant bands, or flats; or they may be set in their permanent location if they can be closely watched for a few days until they have taken hold.

Divisions

For those to whom propagation by cuttings seems too troublesome, there remains propagation by root divisions. When the stock is free of disease, and the soil too, good healthy plants can be obtained in this way; otherwise, the diseases will be propagated as surely as are the plants.



A Chrysanthemum cutting prepared for rooting

In making divisions, it is well to remove unwanted shoots as they appear. This enables the remaining shoots to become stocky, admits light and air to aid in the fight against disease due to fungi, and helps maintain the lower leaves in a healthy condition. Further, the shoots should be pinched when they reach the height at which branches are desired. Spraying or dusting, and prevention of splash, of course, are just as important for securing clean divisions as clean cuttings.

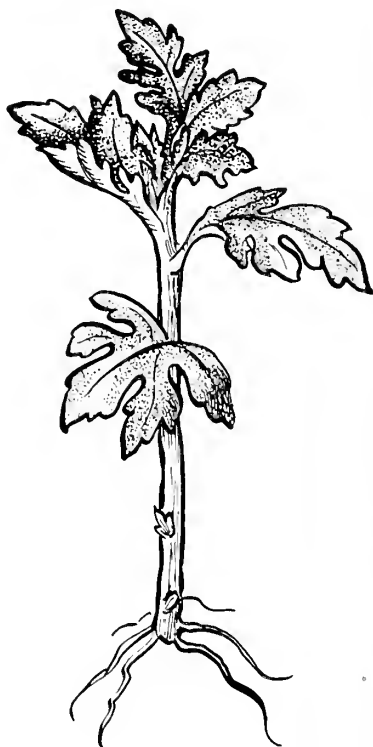
The shoots are allowed to grow until they are well rooted independently of the mother plant. The clump is then dug up and shaken free of soil, and the shoots

individually separated from the mother plant. The shoots may be planted in pots or plant bands until they are established, or set directly into their permanent positions. In the latter case, they require special care for a few days, the same as rooted cuttings.

If the plants have been wintered in a cold frame, care must be taken to hold the stock back; otherwise, the divisions would be ready to set too early, unless it were desired to plant them in the garden in early May. This would result in excessively large plants at blooming time.

All in all, enthusiastic amateurs are usually willing to pay the price of the added labor of making cuttings, in return for the stocky, disease-free, and floriferous plants that they can obtain in no other way.

A rooted cutting



PROPAGATION OF RHODODENDRONS AND AZALEAS

The best methods for the various kinds

Henry T. Skinner

MOST Rhododendrons and Azaleas may be propagated by one of four quite usual methods: by seeds, layers, cuttings, or grafts.

Seeds are suitable for quantity propagation of Rhododendron species, such as the Carolina Rhododendron (*Rhododendron carolinianum*), and the Rose Bay and Mountain Rose Bay (*Rhododendron maximum* and *catawbiense*), and the host of naturally-occurring Rhododendrons of China and other parts of the world; and of Azaleas such as the Torch Azalea (*Rhododendron obtusum* var. *Kämpferi*), and our native Flame Azalea (*Rhododendron calendulaceum*), White Swamp Honeysuckle (*Rhododendron viscosum*), Pinxter-flower (*Rhododendron nudiflorum* and its variety *roseum*), and *Rhododendron arborescens*. Few, if any, of the garden hybrids, however, such as Rhododendron Roseum Elegans or Lady Grey Egerton, or Azalea Hinodegiri or Apple Blossom, will come true from seed. The seeds of even some of the species are doubtful, if these are growing as single plants near individuals of another type. Under such conditions, only controlled hand pollination will ensure reproduction true to name.

Propagation of named hybrids or clones must be by vegetative means; and from the amateur standpoint, the easiest method is layerage. Any form of Azalea or Rhododendron can be reproduced by layering. To be sure, it requires two or three years to derive a sturdy plant upon its own roots; but at the end of that time the plant is a good one, and neither special equipment nor elaborate care has been required.

Vegetative propagation by stem cuttings is entirely satisfactory for certain classes of Azaleas, notably the Snow Azalea (*Rhododendron mucronatum*), and *Rhododendron obtusum*, *indicum*, and *Simsii*; and for a few readily-rooting Rhododendrons, such as *Rhododendron racemosum* and the Lapponicum series. Single-leaf or "leaf-bud" cuttings have been found useful in recent years for many of the taller-growing Rhododendron species and hybrids of which stem cuttings are ordinarily difficult. There still remains a fairly sizable group of Azaleas and Rhododendrons which can be rooted only with such difficulty that cuttings of any sort are generally impractical. The Pinxter-flower and the Mollis hybrids are both in this class, together with the Piedmont Rhododendron (*Rhododendron minus*) and *Rhododendron carolinianum* and *maximum*.

The most practical remaining method of vegetative propagation is grafting. This is widely used in commercial practice, especially for the larger-leaved named hybrid Rhododendrons and the Ghent and Mollis Azaleas. This fact is somewhat unfortunate, in that there is a considerable amount of evidence that an own-root plant is often thriftier and longer-lived than the same variety on foreign roots. In a purchased plant, however, production costs are inevitably important; and, as was pointed out before, reproduction by layering is somewhat slow. Grafting is a greenhouse operation, requiring a considerable amount of skill; and so, in any case, it is scarcely a method to be of much interest to the average home gardener.

Seeds

Seeds of the species and mixed races of Azaleas and Rhododendrons can be gathered as soon as the capsules are beginning

to turn brown, during September or October. If the capsules are dried for a week or two indoors, the seeds can be readily separated by sifting, and may be stored in a dry place until February or March.

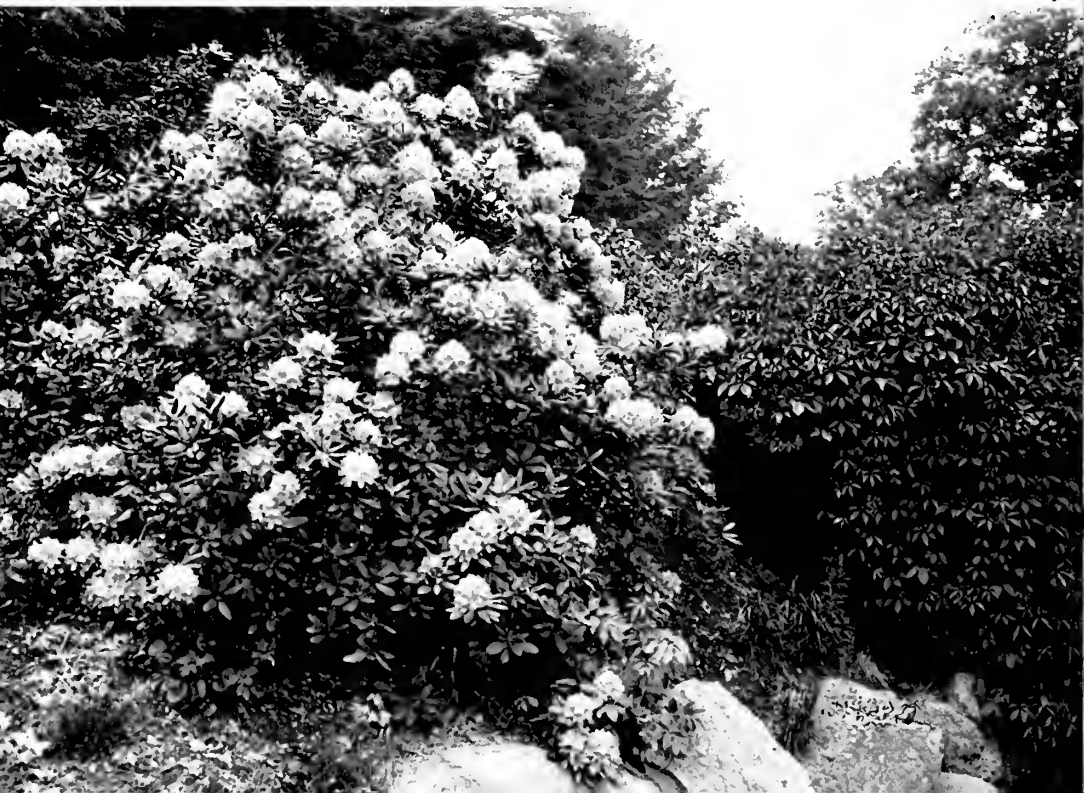
Sowing is an indoor project, in the house or greenhouse, and is best done in pots, bulb pans, or frames, properly prepared with drainage and a suitable finely screened germinating medium. For this purpose Michigan peat with a small amount of acid silica sand works very well; good results have also been obtained with the use of pure sifted Sphagnum moss, vermiculite, or even ordinary sawdust sifted and packed to a smooth, firm surface. All such materials are relatively free from spores of injurious fungi, and possess good moisture-retaining qualities. Sawdust is so lacking in plant foods that periodic watering with a fertilizer solution is necessary as soon as the seed-

lings have made fair growth. The seeds themselves need be covered only very lightly; with Sphagnum moss it is sufficient to scatter them evenly and then jar the pot to shake them down into the moss. After sowing, soak the pot thoroughly by standing it in a pan of water, cover it with a pane of glass, and keep it in semishade at a temperature of about 60° F.

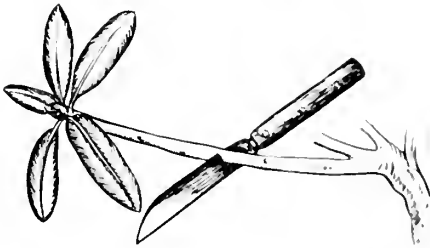
When germination is complete (in three to four weeks) the glass should be removed, to harden the small plants. As soon as two to four true leaves have formed, the seedlings may be pricked off (at 1½- to 2-inch spacing) into boxes containing a mixture of Michigan peat with about one fourth sand and one fourth acid soil. With good care the plants should be large enough to harden off during August for overwintering in a protected cold frame outdoors. The following spring they may be planted into

Mountain Rose Bay (*Rhododendron catawbiense*)

McFarland photo



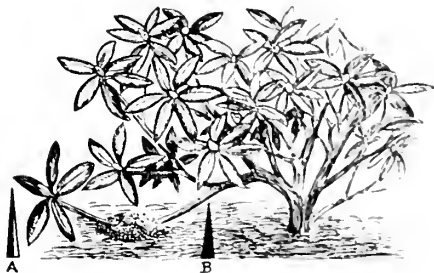
partially shaded nursery beds for their final year's growth before removal to permanent locations. If a greenhouse is not available, the first transplanting may be done directly into the same soil mixture in outdoor frames, provided that good attention is given to shading during periods of bright sunlight, and to watering. Throughout this early growing period an occasional watering with liquid manure, with a complete fertilizer solution, or with a teaspoonful of sulfate of ammonia per gallon, is of conspicuous help in keeping the plants in a vigorous condition. Seeds sown much after the first of April are seldom successful; the young plants seem never able to make satisfactory growth during the summer.



Nicking a *Rhododendron* branch in preparation for layering, as shown below between A and B

Layering

Layering consists essentially of selecting a fairly vigorous branch of the desired variety, bending the branch to the ground, covering it with soil, and leaving it for a sufficient time for roots to be produced. The new individual may then

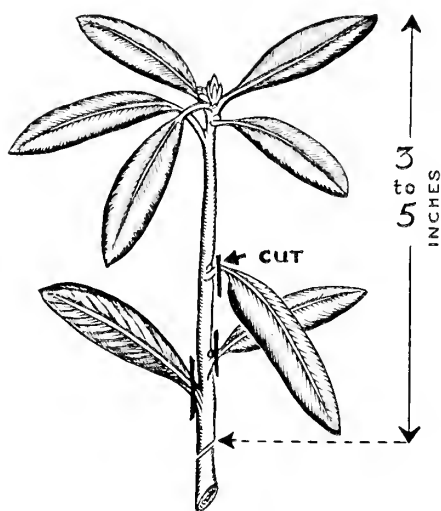


be severed from the parent and planted in its permanent place.

September is a good month for layering. Where the branch touches the ground, nick it with a knife a third of the way through on the underside, cutting towards the tip of the branch. Scoop out a shallow hole in the ground and securely peg down the notched portion of the branch in a generous sample of a mixture of sand and peat-moss. Cover with more of this mixture, and water thoroughly. Several such branches can be layered around a single plant. From then on, the only attention necessary will be to water during dry weather and to see that the layers are not disturbed. Check occasionally for rooting. Most of these branches will make good roots in about eighteen months. The layers may then be completely severed from the parent bushes; but they should be left in place for an additional six months, or preferably a year, before they are transplanted—each one with a good ball of soil. It will have taken two to three years to produce these new plants; but they will be of good size, and there is satisfaction in knowing them to be entirely true to name and on their own root systems.

Stem Cuttings

For those varieties which root readily from stem cuttings, the general principles of cutting propagation apply with but few modifications. The cuttings should be taken during June or early July, when the young shoots are beginning to ripen. They should be 3 to 5 inches long, with lower leaves removed; and may be inserted for rooting in acid sand, a mixture of sand and peat-moss, or vermiculite, in any kind of bench or frame which works well for propagating. Vermiculite must be used in a loose condition, and never tightly packed around the cuttings. Most varieties respond to treatment with one of the more concentrated hormone powders before insertion in the propagating medium, particularly if bottom heat is



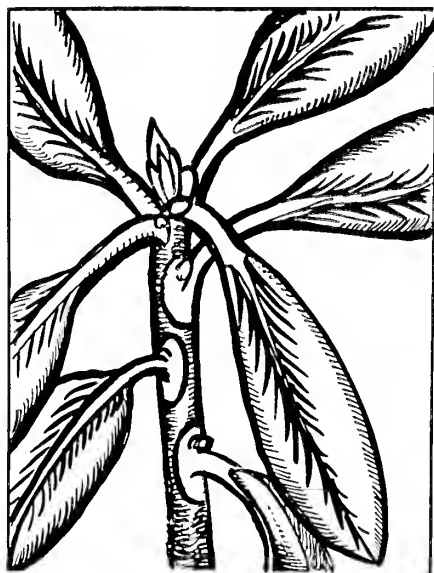
Rhododendron stem cutting, with removal of leaves indicated

provided by means of electric cable regulated to a temperature of 70° to 75° F. A subirrigated cutting bench has been found very good, but is not essential. With proper attention to watering, to syringing when the air is dry, and to shading during bright sunlight, the cuttings should produce good root systems in four to eight or nine weeks. They should then be removed from the cutting frame, and may either be potted in a good peaty soil mixture for growing in the greenhouse, or be planted directly in protected frames outdoors.

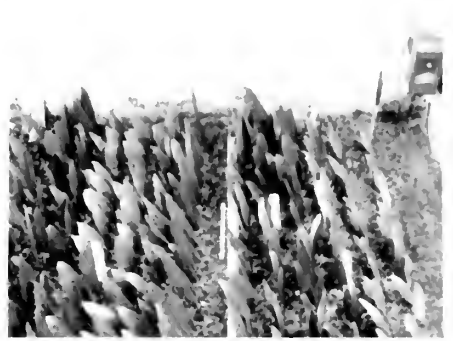
Single-leaf Cuttings

The "leaf-bud" cutting is a slightly different form of propagation, and is useful for several of the large-leaved hybrid Rhododendrons which do not root readily from ordinary stem cuttings. It is an interesting method with which to experi-

Left: Rhododendron branch suitable for making single-leaf cuttings; the "white" area around the bud indicates the portion of stem to be removed with the leaf. Right: a single-leaf cutting with bud and portion of stem attached



ment. The cuttings are taken from ripening shoots in early July or late September. Each of the several individual leaves on such a shoot is cut from the stem with a knife, in such a way that the bud at its base and a portion of the stem remain attached. The stem portion is treated with a hormone powder; the cutting is then inserted in the propagating medium so that the bud is just below the surface and the leaf stands upright. Provision of moisture while handling the leaves, and all the steps in rooting are exactly the same as for stem cuttings. When a good root ball has been formed, the cutting may be potted or transplanted; and again, the bud must be kept approximately at the surface. The shoot which forms the new plant will develop from this bud either in the fall or in the following spring; and from then on the development of the new individual is fairly



Author photo

Rhododendron leaf cuttings in propagation frame with bottom heat (from electric cable)

rapid. With experience, many forms of Rhododendrons (such as Catawba hybrids, for instance), and indeed many other kinds of evergreen plants, can be reproduced by the single-leaf method.

Left: Rhododendron leaf cutting rooted, with new shoot developing from the bud. Right: sturdy young plant developed from leaf cutting—old leaf still attached



DISTRIBUTION AND CLASSIFICATION OF RHODODENDRONS

*Wild and cultivated—including
Azaleas*

Clement Gray Bowers

GARDENERS in the northeastern United States have long been accustomed to recognize two groups of brilliantly flowered, related shrubs as Azaleas and Rhododendrons respectively. People first knew them as wild American plants: the Azaleas deciduous, and very distinct from the evergreen Rhododendrons. When intermediate forms subsequently turned up in Asia, botanists gathered all the species together and put them into one comprehensive genus called *Rhododendron*. This happened a century or so ago.

Since that time, and most notably in recent years, all sorts of new things have been filtering into horticulture under the general label of Rhododendron. Beginning with relatively few kinds—all that

were known to science in the year 1800—the number of recognized species has now approached a thousand, plus at least two thousand more names attached to varieties, clones, and forms. The greater amount of this expansion has occurred in our generation, and is the result of botanical exploration in the Asiatic hinterlands.

Native in Europe and America

Rhododendrons were not cultivated in Europe or America until the mid-eighteenth century, when the Rose Bay (*Rhododendron maximum*) was introduced into England through American seed. Europe has only a few native species—the little “Alpine-Rose” from Switzerland, plus a few evergreen species and a yellow Azalea from the Black Sea region. With the exception of a very few that came in early from the Orient, the cultivated Rhododendrons of the nineteenth century comprised mainly a dozen

Dots indicate where Rhododendrons and Azaleas grow wild in the Western Hemisphere





The native haunts of Rhododendrons and Azaleas in the Eastern Hemisphere

or more species from the eastern United States; and British nurserymen got the habit of listing all Azaleas and Rhododendrons as "American plants." Besides these early species, less-known sorts from the deep South, the west coast, and the Arctic account for over another dozen, and complete America's total of wild species.

Native in Asia

A few more occur in northeastern Asia, mainly Korea. Japan and nearby islands have about twenty species, several of which have become successful introductions here. There is a similar number of additional species in eastern China and central China. However, in the mountains of western China, adjacent Tibet, the Himalayan region, southeastern Asia, and Malaya, is found the world's great center of Rhododendrons. Literally hundreds of species, ranging from giants of the rain forests to dwarfs of the moun-

taintops, occur in this region. These include tropical sorts, some of which are epiphytic and cling to the tree trunks like Orchids. Much of this area, having been but recently explored, has yielded quantities of new species which are now in cultivation—mostly, however, in places where mild winter temperatures prevail. Thus the list of wild species has been greatly expanded.

Probably because few of the new species are completely hardy here, we in the eastern United States have been slow to perceive this expansion; and occasionally we hear gardeners from more favored climes talking glibly about multitudes of new Rhododendrons that are quite unfamiliar to us. Yet we have profited, too, by several introductions from Oriental sources (such as the Torch Azalea—*Rhododendron obtusum* var. *Kacamfferi*), which have come into general use here. Now we are beginning to see a few half-hardy hybrids, with the future prospect of great expansion in this category.

Classification

Meanwhile, so many new kinds of *Rhododendrons* have been coming in from Asia that it has been difficult to classify them. Conclusions made today are altered by tomorrow's new developments. Vast numbers of the species interbreed freely, or have the capacity to do so; and one might suspect that scores of kinds now listed as species may ultimately prove to be mere natural hybrids or geographic forms.

Facing this problem, British botanists have erected a temporary device for pigeonholing the various sorts. Species which seem obviously related have been put together in special groups called "series." The natural relationships between these series have not yet been clearly defined; and so, in the genus *Rhododendron* as a whole, we now have some nine hundred-odd species, which have been thrown into some forty-odd piles constituting the series. This is a useful expedient, but it does not give us a clean-cut

pattern for classification. Add to this the confusion arising from the growing number of hybrids (of mixed ancestry cutting across the whole genus), and the picture becomes still more complex. Obviously, no classification can be made at the present time with any view toward finality.

Regarding the series, we can at once set aside certain groups that are significantly distinct; some contain only one or two outlying species. Other groups, less distinct, intermingle and merge. Since deciduous and evergreen species sometimes occur in closely related groups, the longevity of leaves does not constitute a clear line of separation. A better characteristic is the dot-like scales borne on the underside of the leaves of some species, such as the Carolina *Rhododendron* (*Rhododendron carolinianum*), and not of others, such as the Rose Bay (*Rhododendron maximum*). Some writers think that these features are significant in determining ability to hybridize. Species having scales are described as *lepidote*, while those without them are *elepidote*.

Not all of the species are distinct. Among our American deciduous Azaleas, especially, certain species have outlying forms which seem to overlap with related species, giving credence to an opinion that transitional forms and natural hybrids probably exist. One can regard such a species only as an average type, around which a certain population seems to rotate. It may be a long time before botanists (with their cytological and taxonomic studies) reach valid conclusions; and meanwhile we must use stopgaps.

Rose Bay (*Rhododendron maximum*)

McFarland photo



The illustrations on pages 21 and 22 are for comparison only of form, not of size.

All McFarland photos, except *Rhododendron arborescens* and *racemosum*, which are published by courtesy of *My Garden Magazine*.

A FRAGMENTARY VIEW OF CERTAIN RHODODENDRON GROUPS SIGNIFICANT TO
HORTICULTURE IN THE EASTERN STATES

I. Leaves generally thin; deciduous or semi-evergreen outdoorss

Azalea series

1. With 5 stamens only.subseries *Luteum*
 - a. Flowers usually under 2 inches across; mostly American:
Rhododendron arborescens, *atlanticum*, *calendulaceum*, *canescens*, *luteum*,
nudiflorum, *occidentale*, *prunifolium*, *roseum* (*nudiflorum* var. *roseum*),
speciosum, *viscosum*, and others.
 - b. Flowers usually 2 inches or more across; eastern Asia:
Rhododendron molle and *japonicum*.
 - c. Hybrids of the above:
Ghent hybrids, Mollis hybrids, and double hybrid forms.



Sweet
Azalea
(*Rhododendron*
arborescens)

Chinese
Azalea
(*Rhododendron*
molle)



2. Usually with more than 5 stamens.
 - a. Flowers and leaves from the same bud.subseries *Obtusum*
Rhododendron indicum, *Kaempferi* (*obtusum* var. *Kaempferi*), *mucro-*
natum, *obtusum*, *poukhanense* (*yedoense* var. *poukhanense*), *pudchrum*, and
many others, including several cultivated groups, such as Indian, Kurume,
Macrantha, *Malvatica*, *Rutherford*, *Sanders*, and other Azaleas.
 - b. As above, but with leaves in whorls (circles)subseries *Schlippenbachii*
Rhododendron Schlippenbachii.
 - c. Flowers from separate terminal buds; corolla deeply lobed
.....subseries *Canadense*
Rhododendron canadense (*Rhodora*), *Vaseyi*, and *pentaphyllum*.



Rhododendron
mucronatum



Royal
Azalea
(*Rhododendron*
Schlippenbachii)



Pinkshell
Azalea
(*Rhododendron*
Vaseyi)

II. Leaves generally thick and evergreen; lepidote (without scales)

A. Ponticum series

Height 6 to 20 feet; flower truss elongated; corolla 5-lobed. The basic type of hardy evergreen Rhododendron. Species occurring mostly outside the great Asiatic Rhododendron center:

Rhododendron maximum (with long bud scales), *catawbiense* (with short bud scales), *ponticum*, *Smirnowii*, *caucasicum*, and others. Hybrids of each group.

B. Fortunei series

Good-sized plants; large, funnel-form flowers, 6 to 8 corolla lobes, often fragrant; flat-topped flower trusses are common:

Rhododendron Fortunei, *Griffithianum*, *decorum*, *discolor*, and others. Hybrid races, such as *Fortunei*, *Kewense*, *Loderi*, etc.



Rose
Bay
(*Rhododendron
maximum*)

*Rhododendron
Fortunei*



C. Miscellaneous

Certain non-hardy species used in hybridization with the above, some as parents of old-time Catawba hybrids:

Rhododendron arborescens and affiliates.

Rhododendron auriculatum and *Griersonianum*.

Rhododendron Thomsonii, *campylocarpum*, etc.

III. Leaves generally evergreen (except in *Rhododendron mucronulatum*); lepidote (with scales); plants mostly smaller than in II (above).

A. Dauricum series

Outlying deciduous or semi-evergreen species, including:

Rhododendron mucronulatum.



Korean
Rhododendron
(*Rhododendron
mucronulatum*)



Carolina
Rhododendron
(*Rhododendron
carolinianum*)



Mayflower
Rhododendron
(*Rhododendron
racemosum*)

B. Carolinianum series

An exclusively American series and its hybrids:

Rhododendron carolinianum, *minus*, and *Chapmanii*.

C. Ferrugineum series

The "Alpine-Rose" and its hybrids:

Rhododendron ferrugineum and *hirsutum*.

D. Triflorum series

Oriental group with Azalea-like habit; flowers blue, yellow, etc.

Rhododendron Augustinii, *Keiskei*, *triflorum*, *yunnanense*.

A related form is *Rhododendron racemosum*.

E. Dwarf alpine Rhododendrons

These occur in many sorts, including such species as:

Rhododendron lapponicum, *hippophacoides*, *ledoides*, etc.; also unusual forms like *Rhododendron Williamsianum*, in the clepidote group.

F. Micranthum series

A hardy outlier from northeastern Asia, one species:

Rhododendron micranthum.

The accompanying table makes no pretension to completeness, but merely presents in sequence certain groups of Rhododendrons more or less familiar to growers in the eastern States. Scores of kinds (under experiment or locally grown) are not included, and some of them may eventually become of greater significance than these. This is in no sense a list of the best. It is an attempt to place certain familiar species and groups in classified order.

Bearing in mind that many Rhododendron species are variable, it will probably be of greater practical value for the gardener to pay less attention to species and give relatively more consideration to superior races, strains, and individuals. Since most fine Rhododendrons and Azaleas are propagated vegetatively as clonal varieties, the importance of the individual is far greater than that of the population from which it has come. For purposes of classification, superior plants, having certain racial characteristics in common, have been put into groups, such as the Ghent Azaleas, the Kurume Azaleas, the Catawba Rhododendrons, and so on. This is a practice which is bound to expand with the increasing number of hybrid groups which will arise as the newer species become amalgamated into patterns

especially geared to fit horticultural needs. There is many a fine Rhododendron whose hybrid ancestry is so complex that no reference to any one species is feasible in describing the plant. In such a case, only the word "Rhododendron," followed by the common clonal name, can be used to label it.

Centers of Culture

The natural distribution of Rhododendrons in the wild has been mentioned. It may be useful to add something regarding their distribution and ecology in horticulture. England, which has no native species, has become the world's great center of Rhododendron culture and breeding. (This is due to the climate, which is exceptionally congenial to Rhododendrons.) It is largely from this source that new species and hybrids are being sent to us in America. Already, on our west coast, from San Francisco northward, a large assortment of the world's best species and hybrids is being assembled. Persons living in such favored climates are virtually living in another horticultural world when compared with us in the East. Persons here, and elsewhere outside the favored climatic zone, must "cut their pattern according to the cloth," rather than follow the pat-

tern of England or the west coast. We are surely destined to see many new things that will accommodate themselves to our conditions, as well as many improvements of older things through new hybridization. Bearing the glamour of novelty, however, some new things will carry an unwarranted appeal. Hence caution, plus an experimental attitude, should be the gardener's guide. Certain of the new species and hybrids are beautiful beyond description, but multitudes of others are mediocre. It may take a lot of crossing and backcrossing before the beautiful new characteristics can be worked into our ironclad sorts, in forms reliable for outdoor culture in cold climates. In some American situations, it is not a matter of choosing the best from a large list of fine things, as in England, but a matter of finding any one that will thrive at all.

I do not wish to imply that Rhododendrons are difficult of culture. Properly suited to their surroundings, they are among the most satisfactory of cultivated plants and certainly among the most gorgeous. But they are quite specific regarding their requirements; and we already know, from the behavior of the old sorts, that each geographical area has its own list of best kinds. Thus, those best at New York City might differ somewhat from those recommended for either Boston or Washington; a wholly different list would be chosen for the South, and still another for the far West. Local conditions may be altered a bit by adjustments of site, soil, and shelter. But to be truly satisfactory, Rhododendrons and Azaleas must be those kinds which are proved by experience to be adapted to the particular environment, regardless of where they may have originated.

CULTURE OF RHODODENDRONS AND AZALEAS

In ideal and in more difficult regions

H. J. Hohman

"CAN I grow Rhododendrons and Azaleas in my garden?" This query may come from the far North and the Midwest. The answer is not simply "yes" or "no," because varieties of Rhododendrons and Azaleas are not all equally hardy and will not all tolerate extreme changes in temperature. This article deals with the conditions necessary for the growing of a few varieties that have proved to be reasonably hardy.

Climate and Situation

Mild winters and moderate summers are essential to the successful growing of Rhododendrons and Azaleas. The presence of these conditions makes the Chesapeake Bay area an ideal place, in which these plants flourish. Subzero temperatures do occur during the winter, and abnormally hot days do come during the summer; but neither condition continues long enough to do any real harm.

A few precautions to be taken when selecting the location, the method of planting, and the winter care of Rhododendrons and Azaleas are given here, and should prove helpful in meeting changes in climatic conditions.

Rhododendrons and Azaleas "prefer" a position in the garden where they are not continually subjected to the direct rays of the sun; but they cannot tolerate a completely shaded area, either. A position where shadows are cast upon the plants at intervals during the day is essential. A ratio of 60 per cent sunlight to 40 per cent shade should be perfect. Protection from strong, cold, northwest winds is necessary; and evergreens of almost any kind planted to the north and northwest make an excellent setting. If the garden is small, the house or shrub border may serve as a shield against the cold winds, and ornamental trees may be placed so as to provide the necessary shade.

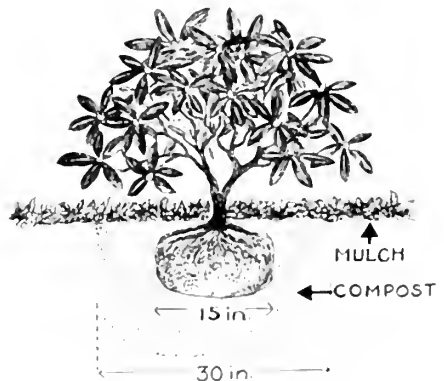
Soil and Planting

The first step toward the successful growing of Rhododendrons and Azaleas is obtaining leafy soil, a compost of decayed wood and leaves. This can be made by building a compost heap of broken-down leaves and woods soil. Such soil can be found where large Oaks and other hardwood trees are growing. If Huckleberry bushes and Trailing Arbutus are flourishing, you can be sure that you have located the finest leafy soil obtainable. Sweep the 1- and 2-year-old leaves that are on that surface into a pile; these may be used later for mulching. After having gathered the top layer, scrape to a depth of 2 inches, and gather the decomposed leaves and soil into piles. These leaves and soil are used to make the compost heap. Turning the heap over two or three times during the season will speed up the decomposition of all the components, so that the leafy soil will be ready for use. Plants supplied with a good leaf compost do not require fertilizer.

The second step toward the successful growing of Rhododendrons and Azaleas is a knowledge of planting methods. Proper planting is to a large extent determined by the root habit of the plants. The roots are very fibrous, and "feed"

near the surface. They rarely go deep; only an occasional base root goes down. The following steps should be a guide in planting a Rhododendron or an Azalea with a ball 15 inches wide and 10 inches deep:

1. Dig a hole 30 inches wide and 14 inches deep. (Guard against a sub-surface of heavy clay.)
2. Loosen the soil in the base of the hole, for proper drainage.
3. Place a 4-inch layer of compost in the bottom of the hole.
4. Set the earth ball so that the plant is centered.
5. Pack the compost tightly around the plant until it is level with the top of the ball and the surrounding surface. This leveling guards against planting too deeply.
6. Water the plant until the top of the fill is saturated.
7. Place a 2-inch layer of mulch around the plant after it has settled firmly. This provides the proper food, and protection against drying.
8. Spread additional mulch over the original layer in the fall.



The very best material for mulching is broken-down leaves. The 1- and 2-year-old leaves gathered from the surface of the ground when making the compost heap are used. Rub these through a 1-inch-mesh wire screen, in order to reduce them to a suitable fineness.

Peat is often used when leaf compost is not available. The proper proportions are 50 per cent good garden soil to 50 per cent peat, thoroughly mixed. When leaf compost and leaf mulch are not used, it may be necessary to apply a fertilizer especially prepared for Rhododendrons and Azaleas, which contains cottonseed meal, superphosphate, and aluminum sulfate.

In the Chesapeake Bay area, September and April are two ideal months for planting Rhododendrons and Azaleas; but good nursery-grown plants may safely be put in from mid-March until after the flowering season, and from August 1 until November 30.

Farther north it is safer to plant in the spring, just as soon as the ground can be worked. This gives the plants an opportunity to become better fitted to survive the cold winter. It is a certainty that many Rhododendrons and Azaleas can be grown in the colder parts of our country if they are given the proper soil, position, and care.

Winter protection of Rhododendron by ever-green branches



Winter Care

The loss of many Rhododendrons and Azaleas is caused by the warm sun on the frosted plants during the winter months. In regions with severe winters, protection provided in the late fall can prevent these losses. Pine and Spruce branches, cut Honeysuckle, and coarse excelsior are safe materials to use because they are light and because they permit air movement and do not retain moisture. Dampness favors mildew and rot, which may bring destruction to the foliage and even to the whole plant. Heavy materials that might cause breakage during the snowy season should never be used. Light materials properly used can effectively protect the plant from the direct rays of the sun. The excelsior or branches should be placed around and over each plant, and tied in place so that strong winds cannot blow them off. The protective covering should remain on the plants until all hard frosts are over. This gives added protection to the flower buds in case of late freezes.

Pruning

Close planting should be avoided, so that each plant will receive ample air and light; then little or no pruning is necessary. Natural growth is far lovelier than hard-clipped or bobbed plants. Crowding causes competition for light; and the result is leggy plants which must continually be cut back. Pruning (when necessary) is simple.

Azaleas are kept in shape by cutting the long shoots back to the main body of the plant. New lateral branches will develop, and the plant will be well balanced once more. Any pruning should be done before June 25, so that the new shoots which develop afterward will have time to produce flower buds.

Rhododendrons can be kept well branched and full by pinching out the terminal bud at the end of each shoot early in the spring; this makes them produce several branches rather than one

leading shoot. But a large well-filled bud at the tip of a stem is usually a flower bud, and should not be removed. Removal of the flowers, as soon as they have faded, will cause the growth of several new shoots immediately. It is best not to let Rhododendrons go to seed because the production of seed stunts their growth.

If it is ever necessary to cut old Rhododendron plants back, because they are leggy and open, this should be done in mid-March. Lateral growths with leaves remaining on them should always be left near the base. If there is no growth with leaves near the base, the main trunk should be bent over (carefully, so as not to break it) and tied down to the ground. In a few weeks swellings will appear along the trunk, which will develop into new branches. As soon as these have grown a foot or so, the old main stem or trunk should be cut off above the point where the new growth started.

Rhododendron Album Elegans

Hardy Varieties

Not all clonal varieties of Rhododendrons and Azaleas are definitely hardy; and so it is necessary to know those that can be depended upon. The following Rhododendrons are rated "A" and "AA," which means hardy in cold areas.

Rhododendrons:

Roseum Elegans
 Catawbiense Album
 Charles Dickens
 Album Elegans
 Atrosanguineum
 Lady Armstrong
 Boule de Neige
 Everestianum
 Fastuosum Flore Pleno
 Ignatius Sargent
 Mrs. (Charles) Sargent
 Lady Grey Egerton
 Lee's Dark Purple
 Catawbiense Grandiflorum



The following Azaleas have proved to be hardy in cold areas, except the Kurume Azaleas. These are not "foolproof-hardy" in northern areas; there, caution must be taken and plenty of protection given. However, in the Chesapeake Bay area practically all of the Kurume Azaleas are perfectly hardy without any winter protection.

Azaleas:

Ghent hybrids:

Pallas	Daviesii
Ignea Nova	Fanny
Nancy Waterer	

Mollis hybrids:

Anthony Koster	J. C. Van Tol
Hugo Koster	William III

Malvatica hybrids (Malvatica Kaempferi):

Betty	Mary
Fedora	Othello

Kurume:

Amoena	Hinodegiri
Cattleya	Hinomayo

Snow

Azalea Louise Gable

McFarland photo



Joseph Gable of Stewartstown, Pennsylvania, has long been working on the introduction of truly hardy Azaleas. In recent years he has originated varieties that will take the place of the Kurume Azaleas, both in hardiness and in beauty. These can well be recommended for gardens farther north than the Chesapeake Bay area. Some of the colors Mr. Gable has obtained are crimson-purple, intense scarlet, clear pink, silvery pink, pink with yellow suffusion, soft salmon-pink (Louise Gable), and pearl-pink (Rose Bud).

Mr. B. Y. Morrison, In Charge of the United States Department of Agriculture Division of Plant Exploration and Introduction, has introduced a new group of hybrid Azaleas which can be rated with the finest. These are known as the "Glenn Dale hybrids" [see page 58], and are very hardy in the Chesapeake Bay region. Just how far north they can be grown is not yet known. Their habit of growth is very strong, and they develop into handsome specimen plants. The flowers are large, usually $1\frac{1}{2}$ to $3\frac{1}{2}$ inches in diameter. There are many shades, such as rich deep red, clear orange, orchid, fuchsia pink, fuchsia-purple, coppery old rose, spinel pink, white with flashes of red, and pure white. A planting of 50,000 of the Glenn Dale hybrids can be found at the National Arboretum in Washington. The display of these plants, when in flower in early May, is indescribable.

For successful growing of Rhododendrons and Azaleas it is vital that the following points be remembered:

1. They flourish throughout the Chesapeake Bay area.
2. They can be grown in colder areas if given proper protection and care.
3. They should not be planted too deeply.
4. Leafy compost is the ideal soil.
5. Proper drainage, and intermittent sunlight and shade are necessary.

MYCORRHIZA IN THE HEATH FAMILY

Its role in the successful growing of these plants

William Flemer, III

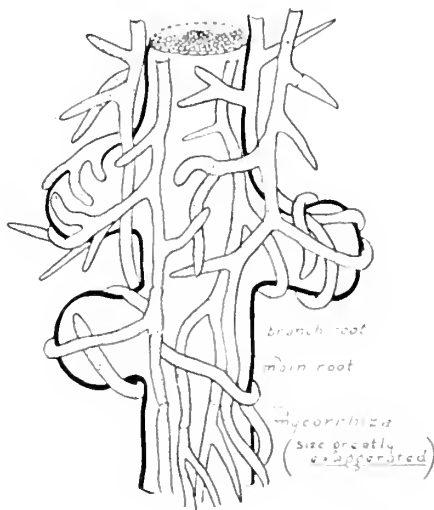
“MYCORRHIZA” is a term used by botanists to describe a condition in which a non-disease-causing fungus lives within or attached to the roots of a seed plant—its host. The word denotes the combination of plant root and associated fungus. The mycorrhizal relationship differs from the *parasitism* of root-destroying fungi in that the fungus and host may derive mutual benefit (in which case the association is spoken of as *symbiosis*); or, in other cases, at least they do not harm each other (*commensalism*).

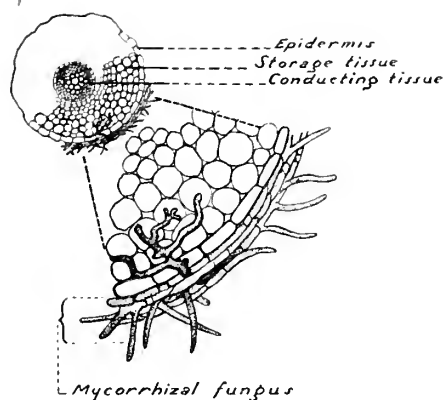
The fungus receives synthesized foods, such as sugar and starch, from the host plant. Just how the host benefits has been much investigated both in this country and abroad, and no single universally applicable answer has been found. Some workers have suggested that certain mycorrhizal fungi can *fix* atmospheric nitrogen [combine it with other elements, in such form that plants can use it], but this has not been clearly proved. It is known that other fungi manufacture growth factors and root-promoting substances. Apparently the most important function of the fungus, with its intricately branching mass of threads, is that it vastly increases the absorptive capacity of the roots. For example, Pine seedlings with mycorrhizal roots have been shown to absorb far more phosphorus, potassium, and nitrogen, than controls [other Pine seedlings for comparison] growing without the fungi. Experiments in afforesting heath or prairie soils have shown remarkably increased growth when known mycorrhiza-forming fungi were added to the plantations. In such situations, where forests have not

grown before, certain forest tree seedlings make poor growth or perish without the presence of appropriate fungi.

It is in the Heath Family (Ericaceae), which includes Rhododendrons, Azaleas, Mountain-Laurel, and others, that mycorrhizal fungi have been shown to play an especially important role. Since these plants do not have root hairs, the formation of mycorrhizas greatly enlarges the scope of the root system and intimately binds the roots to the humus in which they grow. Florence L. Barrows, at the Boyce Thompson Institute for Plant Research (Yonkers, New York), showed that the presence of its mycorrhizal fungus was necessary for the survival and growth of Trailing Arbutus (*Epigaea*). [See PLANTS & GARDENS, spring, 1947, p. 49.] M. C. Rayner, in England, demonstrated that in Heather (*Calluna*) the

Diagrammatic representation of strands of mycorrhizal fungus enveloping a root—root indicated by heavy lines





Cross section of root, with a segment enlarged, showing strands of mycorrhizal fungus enveloping the root and penetrating between and into the cells of the root

fungus associate was present not only in the roots, but throughout the tissue of the whole plant. Moreover, seedlings germinated from surface-sterilized seed soon died unless a culture of the fungus was supplied. The author has isolated a fungus which has given marked stimulation to *Rhododendron* and Mountain-Laurel.

Garden Use

While mycorrhiza-forming fungi are not usually necessary for growing trees in the East, they can be used to ensure the health and vigor of cultivated *Rhododendrons*, *Azaleas*, *Heather*, *Pieris*, and related plants. Supplying suitable fungi is not a substitute for providing proper soil conditions—abundant humus in the soil, and a pH of about 4.5 to 5.0. If these soil conditions are provided, however, and plants of the Heath Family still do not flourish, inoculating with beneficial

fungi is indicated [as the proper remedy]. Such inoculation is most easily accomplished by supplying soil dug from around similar plants growing in the wild. For example, soil from a flourishing stand of wild Mountain-Laurel often invigorates cultivated specimens. In the case of such plants as hybrid *Rhododendrons*, which do not grow wild in the vicinity, soil from beneath established, healthy plants in a nursery or another garden gives a similar result. In many cases, the same fungus may form mycorrhizas with several kinds of plants in the same family. Cultures of a fungus isolated from wild Mountain-Laurel were shown to benefit *Rose Bay* (*Rhododendron maximum*) and *Leucothoe*.

Supplying suitable fungi (by similar simple techniques) is also of great help in growing the various members of the Heath Family from seed. To prevent the attack of disease-producing fungi, the seed should be sown in a layer (an inch or so) of pure *Sphagnum* moss which has been crumbled by being rubbed through a sieve. Below the *Sphagnum* should be a mixture of acid leaf mold and soil from around the roots of healthy plants of the same species. When the roots of the seedlings reach this underlying layer, the plants will be old enough to resist the pathogenic fungi, and will become inoculated with the beneficial one. When the seedlings are transplanted, additional fungus-containing soil may be sprinkled where their roots are to go in the new location.

It must be emphasized that in the case of plants as "particular" about soil conditions as members of the Heath Family, a satisfactory mycorrhizal relationship invariably rests upon the foundation of low pH, high humus content, and adequate moisture in the soil.



RHODODENDRON CULTURE IN THE PACIFIC NORTHWEST

The essentials of proper care

Herbert G. Ihrig

Soil and Fertilizers

THE culture of Rhododendrons begins—in the Pacific Northwest, as elsewhere—with the soil. While the ideal soil has never been determined upon, successful growers are generally agreed that the best is a loose, aerated, well-drained, acid soil, with plenty of humus to hold moisture without its becoming stagnant.

Obtaining acidity of soil is seldom a problem in the area west of the Cascade Mountains; there the soil is usually on the acid side, except where it has been treated with alkaline fertilizers, or where there is lime rubble in the soil, or where rain washes the lime out of masonry or stucco work. Where these conditions prevail, new soil is often required, and proper drainage must be arranged to prevent the lime water from permeating the planting beds. In a few locations, where watering is done with hard water, a slight sprinkling of aluminum sulfate in late July will usually keep the soil at a satisfactory degree of acidity.

It is sometimes difficult to obtain a healthy growth of a new plant which comes with a hard clay-like root ball or one of heavy peat. The first is so solid that it should be soaked and pounded on the ground to loosen the soil, and then planted in regular planting mixture and thoroughly watered. One may think he is committing a crime by disturbing a heavy peat ball; but unless this is broken up, the root growth will be confined to that area and will not grow outward into the regular soil mixture as it should. This was a hard lesson for me to learn;

but when some new purchases stood still for several seasons, in desperation I tried breaking up the ball and found it a success.

Rhododendrons and Azaleas, like all living things, need food. A light annual feeding is usually sufficient for satisfactory growth; seldom do plants require more. The problem is what to feed them and when. Among natural manures, well-rotted cow manure is by far the best. (Chicken manure has too much nitrogen and lime, and creates an alkaline reaction in the soil. Horse manure is likewise alkaline, and frequently too hot.) When a commercial fertilizer is used, it must be one especially prepared for Rhododendrons, partly because it must maintain an acid reaction in the soil, and also because the ratio of its principal ingredients must be quite different from that in the usual formula. The time to apply fertilizer depends on the kind, and on how readily it

Azalea Hinomayo, a Kurume variety

McFarland photo



becomes available to the plant. Manure may well be applied in the fall or winter; but commercial fertilizers, which are soluble, should be used in the spring, to stimulate the plant during the growing period. It is best not to apply fertilizer after June; late applications tend to encourage second growth, which may be cut by the early frosts before it has fully matured.

Sun and Wind

Experience shows that certain plants require some shade, while others do nicely in full sun; it is impossible to lay down a rule, as requirements vary with different plants, and the word "shade" is a comparative term. The sunlight in the Pacific Northwest is not so brilliant or so drying as that in many sections of the country, because it is generally diffused by moisture and by light drifting clouds. On the whole, Rhododendrons in our area will stand far more sun than is usually supposed.

No large-leaved Rhododendron should be exposed to heavy winds or drafts; but small-leaved rock Rhododendrons, like those in the Lapponicum series, will do nicely in such positions.

Watering

Plants should never be permitted to dry out during the growing period. In the spring there is often a period of six

weeks or more of comparatively dry weather; during such a time Rhododendrons should be freely watered. This is essential even after a wet winter. After July, however, watering should be tapered off to permit the new growth to mature and flower buds to form. Continued watering after this time will stimulate second growth, the same as late fertilizing; and the new growth may be cut by frosts. This tapering off does not mean that plants should be permitted to suffer from lack of moisture in the late summer months; by close observation one can readily see when watering is necessary.

What has been said about Rhododendrons applies likewise to Azaleas when grown on their own roots, but apparently not to grafted deciduous Azaleas. Many growers have found that grafted Azaleas deteriorate year after year, and eventually die. Students of the problem have recently come to believe that the graft creates a sort of barrier to the free flow of moisture, and thereby retards growth. Whether this theory will hold, after further experiments, remains to be seen; but when grafted plants are well watered the year round, the loss is considerably less. For evergreen Azaleas, especially the Kurumes, a dry warm summer seems to be a primary requirement. This may account for the fact that many of them are grown more successfully on the east coast than in the Pacific Northwest.

OTHER ARTICLES ON AZALEAS AND RHODODENDRONS IN PLANTS & GARDENS

Shrubs for Special Uses, by Charles F. Doney. Spring, 1945, pp. 20-22.

Plants of the Heath Family for Suburban Gardens, by Harry Wood. Spring, 1947, pp. 16-26.

Heath Family Shrubs for City Gardens, by Natalie H. Bowen. Spring, 1947, pp. 27-31.



Rhododendron J. H. Van Nes

Rhododendron Britannia





Azalea Paul Schame



Rhododendron Pink Pearl



*Azaleas naturalized in the garden of Mr. L. C. Bobbink
of Bobbink & Atkins*

*The color illustrations
on the four center pages
suggest how Azaleas may be combined
with other plant materials
to add variety of tone and structure*





A Spring Garden

*Azaleas
massed beneath
overhanging Dogwoods*



Chinese Azalea (Rhododendron molle)

Foundation planting, with Azaleas used for color interest





Rhododendron Goldsworth Yellow



Azalea Vervaeneana Coral



Rhododendron Fabia

Rhododendron Cornubia



FUNDAMENTALS OF THE CULTURE OF RHODODENDRONS AND AZALEAS

Based on personal experience in a nursery

Paul R. Bosley

IT appears that we have broken all the rules for the growing of Rhododendrons and Azaleas, and yet have succeeded. In studying our results over a long period of time, we have come to a better understanding of these plants and their requirements.

Many years ago, when these plants were imported from Europe, they were planted without much knowledge of what was required. Some of them lived to be beautiful specimens, while the majority died a quick death; and so people got the impression that with this class of material it was difficult to have success.

I know of no plant that is more expressive of its general condition of health than the Rhododendron. One can tell by the hang of the leaf when it needs water; by the length of the growth, when it needs food; and by the color of the leaves, when it is not getting the right kind of food. If one understands his plants, there is no reason why success cannot be positive.

Soil and Mulches

In the region in which our nursery is located (along the shores of Lake Erie) we have glacial soils; and on many places in our growing areas one could throw a rock to three or four distinctive soil types. This is true of soil throughout the marginal areas along the Great Lakes. However, in our section, no matter what kind of soil types we are dealing with, they are all somewhat acid.

In fact the soils are acid in the whole eastern half of the State of Ohio, while they are alkaline in the western half and

from there to the Mississippi River and far beyond. The line of division swings to the west as it goes south through Kentucky, and continues to swing toward the Mississippi River as it goes farther south. Within the alkaline soil belt, however, there are some island-like areas where the soil is acid, and where Rhododendrons and Azaleas can be grown with little difficulty.

It is true that Rhododendrons must have an acid soil; but I believe that the degree of acidity is not nearly so important as we used to think. The soil tilth or porosity, however, is very vital. Rhododendrons and Azaleas must have well-aerated soil. Grown as nursery plants in a light or porous soil, they develop a root system as round as a ball. When heavy, sticky, clay soil is encountered, it must be prepared with liberal quantities of humus to make it open and porous. Under these conditions one is perfectly justified in doing deep and thorough cultivation around his Rhododendrons at least once a year. I, personally, like a quantity of Pine needles mixed in the soil where the Rhododendrons are to be grown; but I usually have to recommend baled peat-moss, because it is more readily available to people in the metropolitan areas.

In our permanent display planting we use a semiheavy mattock hoe; at least once a year we hoe among our plants, leaving the ground in a more or less rough state. In our nursery rows, we cultivate with horse or tractor, as deeply as the equipment will go.

Anything that tends to shut off the air from the roots of these plants will destroy them. Several times we have suffered loss from flash floods. On one occasion, a vigorous block of young Rhododendrons was completely inundated for a period of not more than thirty minutes. Another

time a number of plants was submerged for possibly an hour, and a layer of silt was left over the area. The plants that were completely inundated died, 100 per cent, within a few days; while the partly inundated material suffered severe damage.

A great deal has been written about using leaves as a mulch. Some kinds of leaves pack down in shingle-like fashion, and tend to keep the soil sealed from the air. Mulches must not be of the type of

material that will pack, because soil porosity is the real key to the successful growing of Rhododendrons and Azaleas.

We have found a mulch of *fresh* cow manure good, because it disintegrates and promotes bacterial action in the soil. We firmly believe in the application of any acid organic material, such as cottonseed meal, soybean meal, grape pomace, apple pomace, or even rotted apples.

Where it is necessary to produce a quick change in acidity, we recommend

Rhododendron Mrs. C. S. Sargent

McFarland photo



iron sulfate in preference to aluminum sulfate for any of the Occidental varieties of these plants. The Oriental members of the group seem to "resent" iron sulfate. We use ordinary flowers of sulfur, cultivated into the soil, to maintain acidity.

Wind and Sun

The successful location of a planting varies with many factors; but there is one universal rule that we recommend. Each person can apply it to his own conditions. Never plant any of the evergreen members of this group where they will be severely wind-swept while they are frozen. A broad-leaved evergreen needs moisture in the winter; wind, added to freezing conditions, tends to dry out the leaves, and either partially damage them or destroy them altogether.

Generally speaking, Azaleas require more sunshine, to develop a full quota

of flower buds, than Rhododendrons. An exception is the *Kaempferi* group of Azaleas, which do very well in partial shade.

Flowers versus Seeds

The query that we receive oftener than any other is: "Why do my Rhododendrons and Azaleas only bloom every other year?" We find, invariably, that the plants have been allowed to go to seed; in that case, the strength of the plant (during the late summer and early fall) goes into seed formation rather than into the development of flower buds for the next year. Removing the flowers, as soon as their beauty is gone, induces the plant to set more flower buds for the following season.

This is not intended as a complete treatise on the growing of these plants, but these are the points that we consider basic.

AZALEA CULTURE IN THE SOUTH

Look to the soil

Ferris S. Batson

AZALEAS have grown much in popularity in the South in recent years; and it is not likely that interest in them will wane. They are among the easiest of plants to grow, if they are placed in situations that meet the requirements of the various kinds. Not all species and varieties of Azaleas require similar conditions for best growth; but those which have been most extensively planted in the South have much in common as to culture and care required.

Most of the disappointments in growing Azaleas in the South have been due to unfavorable soil conditions, or to using kinds not winter-hardy in areas a considerable distance from the coast. There

are many species and varieties adapted to the cooler regions of the South; but it is difficult to overcome the disadvantages in many areas where the lime content of the soil is relatively high. Some large areas, such as the Mississippi River Delta, are very fertile but relatively high in lime content; consequently, it is difficult to handle Azaleas in such areas, and frequent treatment is required to maintain an acid condition of the soil. Perhaps in such areas it is better to grow other shrubs, that thrive without special treatment.

Varieties

The Indian and Kurume varieties are more extensively grown and more widely available in the South than other Azaleas. The Indian varieties are somewhat variable as to winter-hardiness, but most of them should be used only near the coast from southern Virginia to Texas. Ku-



McFarland photo

Pinxter-flower (*Rhododendron nudiflorum*)

rume varieties are hardier, and are used throughout most of the Southeast where soils are favorable. Some of the hybrids, such as Belgian, Sander, and Rutherfordiana, should be used with caution, since many of them are rather tender and suitable only near the coast line. Further testing of these hybrids will indicate the varieties that may be grown in the cooler areas of the South.

The deciduous species and hybrids of Azaleas, which are generally easier to grow, have been used little in most parts of the South. This is probably due to the small stock of these plants grown by southern nurserymen. More than a dozen species of Azaleas are native to the South (for example, *Rhododendron alabamense*, *arborescens*, *austrinum*, *canescens*, *ob-*

longifolium, *prunifolium*, *scrulatum*, and *speciosum*, the Flame Azalea—*Rhododendron calendulaceum*—and the Pinxter-flower—*Rhododendron nudiflorum*), but relatively few of them have been used in landscape plantings. These, along with other deciduous groups such as the Ghent, Kaempfer, and Mollis hybrids, should be more extensively used, because of their interest, beauty, and wide adaptation. Anyone interested in commercial production should find a ready market for the deciduous Azaleas in the South.

Site and Soil

In choosing a site for Azaleas, several things should be considered. Low places, where cold air settles, should be avoided, especially for early-blooming varieties

that are most likely to be injured by frost. Although a few Azaleas are best adapted to shade, most of them should be exposed to full sun at least part of the day. Azaleas require acid soil. In areas where soils vary considerably in degree of acidity, hilltops or hillsides are more acid, and bottomland more nearly alkaline. Well-drained soil is absolutely essential. In poorly drained areas, agricultural tile is usually good for providing drainage, if the topography of the land and other conditions permit its use.

In making base plantings around newly constructed buildings, any free lime left in the soil by construction crews should be removed. Heavy equipment, such as a bulldozer, is frequently used to grade around new buildings, leaving the subsoil for the finished grade. Under these conditions, or where soil is alkaline or unusually sandy, it is best to remove the soil to a depth of 12 to 18 inches, where Azalea beds have to be located, and fill the space with acid soil containing a high percentage of organic matter. Under most conditions, however, the addition of organic matter to the existing soil in the planting bed is sufficient. Acid peat or acid leaf mold is excellent for this purpose. If soils in a particular region are not generally acid, tests should be made in the planting area. A pH of 5 to 6 is best for Azaleas.

If soil tests cannot be made locally, they will be done without charge, in most States, by the agricultural experiment station or agricultural college. Sulfur or aluminum sulfate may be used to make a soil more acid, but the soil analyst can best advise as to the quantity required for a particular soil.

Yellowing of leaves between the veins is usually an indication of iron deficiency. Spraying the foliage with copperas (iron sulfate), at the rate of 1 ounce per 2 gallons of water, at three- or four-day intervals, will check this yellowing temporarily; but maintaining a pH of 5 to 6 is the way to correct the deficiency.

Mulches and Fertilizers

Mulching is one of the most important practices in the care of Azaleas. Mulching during the summer is vital for young plants; however, continuous mulching of all plants should be practiced. Azalea roots are shallow, and mulches protect them against dry, hot weather during the summer. Mulches also reduce the need of weeding. The root system must not be disturbed by hoeing. Any one of a number of materials makes a satisfactory mulch: acid peat, Pine needles, leaves, peanut hulls, ground corncobs, Sugar Cane refuse, cottonseed hulls, or sawdust. The mulch may be 2 to 4 inches deep, depending on the material used. Mulches considerably reduce the need of watering, but water may be required during extremely dry, hot weather.

There are no experimental data to guide us in the time of fertilizing Azaleas, but spring applications are probably best: first, about the time growth starts, and again in late May or June. Special Azalea fertilizers are widely used, and generally give good results; or a mixture may be used, of equal parts of 5-10-5 fertilizer and cottonseed meal, at the rate of 2 to 3 pounds per 100 square feet. The procedure is to remove the mulch, spread the fertilizer over the surface of the ground without digging it in, then replace the mulch. Established plants mulched regularly with peat usually make satisfactory growth without additional fertilizer.

Transplanting

Although Azaleas are relatively easy to transplant, a few precautions will pay dividends in increased growth. Transplant between November and April; cut as few roots as practicable in digging from the wild; do not allow roots to dry out; set plants the same depth as they were grown originally; pack good Azalea soil well around the roots; and add water, to settle the soil and to provide moisture for the plant.



McFarland photo

Azalea Coral Bells, a Kurume variety useful indoors and out

HOW TO FORCE AZALEAS IN THE HOME GREENHOUSE

And keep them year after year

Conrad B. Link

AZALEAS are among the most practical plants for the small home greenhouse, and are as easily forced as the Narcissus or the Hyacinth. Azaleas give an abundance of bloom, stay in flower a long time, and may be forced year after year.

Varieties

The Kurume hybrids and the Indica hybrids are the most commonly forced,

with the newer Rutherfordiana hybrids increasing in popularity. The forcing of Azaleas is simple. They are rather slow-growing, and so it is generally best to purchase blooming-size plants.

The easiest varieties to force for Christmas are:

Indica hybrids—Mme. Petrick, Mme. Petrick Superba, and Vervaeneana.
Rutherfordiana hybrids—Alaska, Rose Queen, and Orange King.

Kurume hybrids—Coral Bells, Christmas Cheer, and Hinodegiri.

For after-Christmas forcing, in addition to the above-mentioned varieties, I would include:

Indica hybrids—Professor Walters, Empress of India, and Mme. Van der Cruyssen.

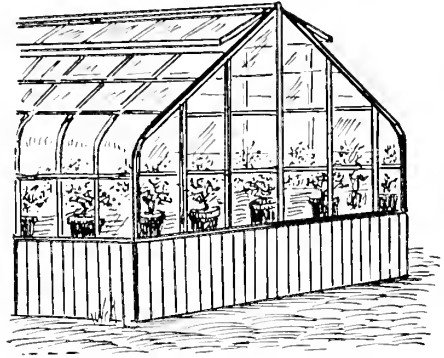
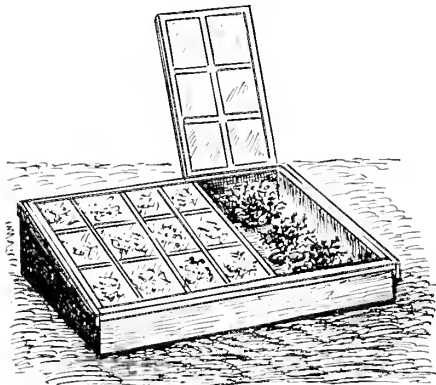
Rutherfordiana hybrids—Indian Chief, Lambertus Bobbink, and Snowbank.

Kurume hybrids—Hexe, Snow, Bridesmaid, and Azuma Kagami (Pink Pearl).

Forcing Schedule

Plants are generally received from the nurseryman in the fall. They are placed in a cold frame in late September, when there is danger from frost, and protected so that they will not freeze; or they may be placed in the greenhouse in as cool a spot as possible, or in a cool cellar at a window; it is desirable to store them at about 45° F. Light is essential during the storage period; otherwise they will lose many or all of their leaves. The forcing types are evergreen or semi-evergreen. After mid- or late November, or later, they may be brought into the greenhouse at 60° F. Those intended for Christmas flowering should be brought in in early November; but they must have had three or four weeks at 45° F. in order to be certain of flowering at Christmas.

Cold frame for the storage period of Azaleas in the fall

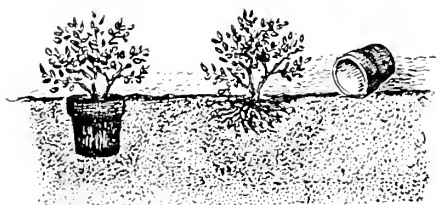


Greenhouse for the forcing period of Azaleas

A plant or two may be brought into the greenhouse every few days, to provide a succession of bloom. Plants will be in flower in thirty to sixty days, depending on the kind.

After flowering, Azaleas are kept in the warm greenhouse until late spring. Then they are put out of doors, planted or plunged (set into the soil in their pots) in a partly shaded area; or they may be put in a frame covered with a cheesecloth or lath shade. It may be necessary to repot the plants after flowering. An acid soil should be used, with peat added. In areas of the country where the soil is naturally alkaline, it is preferable to pot in peat alone, or in a mixture of equal parts of peat and acid sand. If peat alone is used, care must be taken to avoid overwatering. In any case, make sure that there is good drainage in the bottom of the pot. If alkaline water is used, it will gradually make the soil less acid and interfere with the intake of iron by the plant; but this may be overcome by watering every two or three weeks with a solution of aluminum sulfate at the rate of ½ ounce to a gallon of water.

Azaleas should be pruned to keep their shape attractive. This may be done—until mid-July—simply by pinching back the new growth, to induce branching.



Azaleas planted or plunged outdoors for the growing period

During the summer they must be well watered; syringing will encourage healthy growth. Spraying may be necessary for thrip and red spider control. About mid-August the shade over the plants should be removed, and the plants exposed to the full sun. By mid-September they are ready to be placed in their cool storage again, until time for forcing for another season of bloom.

LOW-GROWING COMPANIONS FOR AZALEAS AND RHODODENDRONS

Azaleas and Rhododendrons which are growing in the sun generally develop branches close to the ground. Some, however, may grow more or less upright; and where they are growing in partial shade, they may not be very compact. Under such conditions, ground-cover plants are useful in providing a little foliage and perhaps some color. This is especially desirable where these shrubs are used in foundation plantings or in more formal areas. Some of the ever-green ground covers, such as English Ivy (*Hedera Helix*), Periwinkle (*Vinca minor*), *Euonymus Fortunei* var. *radicans*, Pachysandra, and *Pachistima Canbyi*, are useful to face down such plantings. Bugle-weed (*Ajuga*) will grow in sun or partial shade, and produces blue flowers in May and June. In more open plantings, in woods or in informal plantings, many spring-blooming plants may be used effectively. The late-blooming Narcissi

are ideal companions for Azaleas. Coral-bells (*Heuchera sanguinea*), Blue Phlox or Wild Sweet William (*Phlox divaricata*), Epimedium, and Lily-of-the-valley are spring-flowering perennials that will grow in conditions congenial to Azaleas.

Several low plants of the Heath Family, of which Azaleas and Rhododendrons are members, are natural companions for these taller shrubs. The Trailing Arbutus (*Epigaea repens*) is one of the most desired. The Wintergreen, or Checkerberry (*Gaultheria procumbens*), common in many woods of the eastern United States, and the Bearberry (*Arctostaphylos Uva-ursi*) are not so showy as the Trailing Arbutus, in flower, but they provide attractive foliage the year round. These plants do not transplant easily, and so they should be purchased from nurserymen as pot-grown plants.

Bearberry (*Arctostaphylos Uva-ursi*)

11.227





McFarland photo

LANDSCAPE USE OF RHODODENDRONS AND AZALEAS

Rhododendrons and Azaleas afford massive areas of bloom that combine well with other plants or contrasting foliage and growth forms—such as Pine and Box. They also add charm to a garden by their adaptability to its architectural layout. They may be used successfully to accent a spot of special interest—an approach to a bridge, a pool or bit of statuary—and what could suggest a warmer hospitality than a border of Rhododendrons and Azaleas along the path to one's door?



McFarland photo

Azaleas and Pine—a striking combination



McFarland photo

Azaleas blended with many kinds of plants

Gottsch-Schleisner photo





McFarland photo

Rhododendrons used to beautify the approach to a bridge

RHODODENDRONS AND AZALEAS IN THE GARDEN

How to use them for harmony in color and in form

Alice L. Dustan

RHODODENDRONS and Azaleas are among the choicest and most costly of all shrubs; yet they frequently end up as a blatant crash of bad taste in a spring garden. When this happens, it is usually because the owners have bought indiscriminately, failing to realize how many of the brilliant-flowered species and varieties overlap in time of bloom.

Color Scheme

When flowers are being considered, probably the best rule is to stick to one harmonious color scheme throughout the garden: use either warm tones, such as yellow, salmon, and brick red, or a cool blend of blue-pinks, including lilac, lavender, and crimson. The chart at the end of this article is a guide to steer the gardener around the pitfall of color clashes in Azaleas and Rhododendrons. White and pastel flowers blend with either yellow-red or blue-pink.

Several Rhododendron hybrids and the Ghent hybrid Azaleas can be bought as named varieties. Many species, however, are available only as blends of assorted colors. These plants are grown from seed, not grafted; and this gives great variation in color. An example is the Chinese Azalea (*Rhododendron molle*), whose seedlings range from delicate yellow to brick red. The flowers of the Carolina Rhododendron, too, vary from white to clear pink, and a light rosy purple that is definitely off key with the salmon pink of pink Dogwood.

Some nurseries go to the trouble of tagging or grouping particular flower

shades, while others do not. In any case, the gardener who lives near a nursery is wise if he selects his plants while they are in bloom. Azaleas that bloom before the leaves unfurl can be dug, transported, and set out in the garden while they are flowering. However, the Flame Azalea (*Rhododendron calendulaceum*) and other types that push out their new growth at flowering time should be tagged for September delivery.

Form

With the color scheme settled, it is well to get on to an equally important matter—really, a more important one—the selection of Rhododendrons and Azaleas as structural elements in the garden. Their flowers last, at the most, but three or four weeks each year; but their growth habits and foliage textures (if evergreen) can be depended on for year-round effect. Nursery-grown Rhododendrons range in height and foliage character from the three-foot-tall, compact, small-leaved *Rhododendron arbutifolium* to the towering, bold-textured Rose Bay (*Rhododendron maximum*).

Azaleas offer a choice almost as wide in heights and textures; but in the latitude of New York City and farther north, few of them can be counted on for effective winter foliage. Of the so-called evergreen types, the only ones that hold all their leaves in the winter are the Amoena Azalea (*Rhododendron obtusum* var. *amocuum*) and Azalea Hinodegiri. These two squatty Azaleas do have singular value in the landscape. Their foliage matches the Boxwood's in size; but their structure is looser, with horizontal branching that gives a picturesque aspect never found in the more formal Box. Their leaves turn a deep reddish purple in autumn, in contrast with those of the



McFarland photo

A charming garden with Azalea Amoena in the foreground

many evergreens that remain a uniform deep green. Their flowers, in early spring, make sheets of color so intense that these shrubs are best planted away from other bloom, against a neutral deep green background of Hemlocks and late Rhododendrons. Flowers of Amoena are bright magenta; those of Hinodegiri, an intense but pleasing crimson that unfortunately fades out to a bluish tone.

The Snow Azalea (*Rhododendron mucronatum*), the Torch Azalea (*Rhododendron obtusum* var. *Kacmpferi*), and the Kurume varieties—so-called evergreens—are really but semi-evergreen in northern States. In early winter most of their leaves drop, except a few surrounding the buds at the tips of the branches. Their thinned-out appearance largely cancels their winter landscape value—the same as in the many strictly deciduous Azaleas. The deciduous Azaleas are generally taller and of more open growth than the Obtusum group, and are

dominant only at flowering time. Their chief use is for flower accent with evergreens, or scattered in informal groups through light woodlands.

Position

Northern gardeners, then, must depend largely on Rhododendrons rather than on Azaleas as year-round background and accent shrubs. A sizable garden that has room for extensive plantings can include the whole range of hardy species, worked out in a graded blend of heights and textures. Then Azaleas may be woven into the foreground to lighten up the Rhododendrons and to push the season of bloom back to Forsythia time. High-branching Oaks cast the ideal light shade for Rhododendrons, and congenial Yews and Hemlocks may be used as contrasting needle-leaf evergreens.

Rhododendrons are ideal for small gardens, also; but some of the late-flowering types will probably be ruled out because

they are outsize both in height and in leaf texture. A Rhododendron that fits especially well into small areas is the Carolina Rhododendron (*Rhododendron carolinianum*), with its medium-size leaves of a dull olive green. A group of Mountain-Laurel (*Kalmia latifolia*) or of Pieris, or a well-placed single specimen of a hybrid Rhododendron—all with glossy foliage—will live up a mass planting of Carolina Rhododendron. And a small Flowering Cherry or Crab Apple will give the planting interesting winter form, as well as spring color.

In a tiny garden with a good architectural background of a high fence or wall, a single mature Rhododendron will give even a new planting an established look. The owner might, for instance, put a third of his year's shrub funds toward one big handsome specimen. Other Rhododendrons and Azaleas may be bought in small sizes and planted as a ground pattern below the large Rhododendron. In the five or six years during which these small shrubs are developing, the intervening spaces may be filled with blending low perennials and bulbs, to keep down weeds and to give added seasonal color. The small shrubs will eventually grow tall, but the big Rhododendron will always dominate and unify the planting.

Ground Covers

Good ground covers to grow in the humus soil between Rhododendrons and Azaleas are Astilbe, Epimedium, Forget-me-not, Running-Myrtle or Periwinkle (*Vinca*), Lungwort (*Pulmonaria*), Primrose, Bugle-weed (*Ajuga*), and several members of the Heath Family, such as Wintergreen, Bearberry, Lowbush Blueberry, and Leucothoe—the last really a low, arching-stemmed evergreen shrub.

"Wood-Hyacinths," or Spanish Bluebells (*Scilla hispanica*), Narcissi or Daffodils, several Lilies, and the July-blooming pink Hardy Amaryllis (*Lycoris*), not to mention Trilliums and other natives, are all good hardy bulbs to combine with these ground covers in partial

shade. Tuberous Begonias, started indoors in February, may be set out in May for summer color in areas that were filled with Primroses in the spring. (The Primroses are dug and divided after bloom, planted in an out-of-sight shady spot for the summer, then moved back when the Begonia tubers are dug for winter storage in the fall.)

Near the House

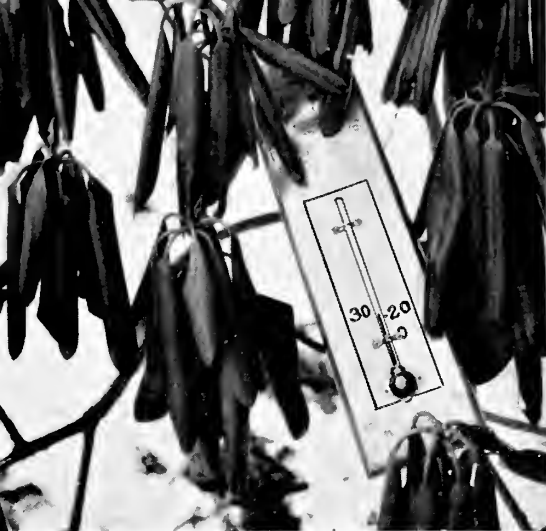
Rhododendrons are choice plants to use beside the house, as they are beautiful at all seasons (except, perhaps, when near-zero temperatures cause their leaves to roll into cigar-size tubes). Some large hybrids may be used at the house corner, and repeated as part of the boundary planting, with tree accents of Hemlock and Sour-wood (*Oxydendrum arboreum*).

An especially handsome Rhododendron hybrid may be planted in the important position beside the front door. A Dogwood tree might balance the Rhododendron, and have an underplanting of the

Rhododendrons and Azaleas along a walk

McFarland photo





McFarland photo

Characteristic rolling of *Rhododendron* leaves in cold weather

very low Rockmount *Rhododendron* (*Rhododendron arbutifolium*). This compact *Rhododendron* has leaves much like those of Mountain-Laurel, but about half their size. Its light pink flowers follow by about a month the May bloom of the Dogwood. For delicate pink bloom, simultaneously with the Dog-

wood's, the Pinkshell Azalea (*Rhododendron Vaseyi*) may be planted to grow up through the tall *Rhododendrons* at the house corner and in the boundary planting. Here, again, the low *Rhododendron arbutifolium* may be used as foreground planting. This repetition will help knit the whole planting together.

Unity

Without repetition of foliage size and of flower color, a garden will be a mere hodgepodge of plants. The planner should constantly work toward unity, rather than squeezing as many different kinds of plants as possible into a given area. With plant repetition assured, he may introduce a few accent plants in the form of small trees or deciduous shrubs.

Final Selection

The final choice of plants may well be guided by the garden owner's desire for a succession of bloom throughout the season. The following chart will help him select *Rhododendrons* and Azaleas for succession of bloom, as well as for correct heights and flower color combinations.

CHART OF RHODODENDRON AND AZALEA BLOOM

Time	Name	Height in feet	Flower Color		Pastels
			Warm tones, yellow-red	Cool tones, blue-pink	
Late April— with Forsythia and Pieris	"Korean Azalea" (<i>Rhododendron mucronulatum</i>)	4-5		rosy purple	
Early May— with Flowering Cherries	Snow Azalea (<i>Rhododendron mucronatum</i> or <i>ledifolium album</i>)	3-4			white
	Amoena Azalea (<i>Rhododendron obtusum</i> var. <i>amoenum</i>)	3-4		rosy purple	
	Azalea Hinodegiri (<i>Rhododendron obtusum</i> variety)	3-4		crimson	
	Kurume Azaleas (<i>Rhododendron obtusum</i> varieties)	3-4			pastels
Mid-May— with flowering Dogwood	Torch Azalea (<i>Rhododendron obtusum</i> var. <i>Kaempferi</i>)	3-4	orange, red		
	Pinkshell Azalea (<i>Rhododendron Vaseyi</i>)	5-8			pink
	Royal Azalea (<i>Rhododendron Schluppenbachii</i>)	5-7			pink

CHART OF RHODODENDRON AND AZALEA BLOOM—Continued

Time	Name	Height in feet	Flower Color		Pastels
			Warm tones, yellow-red	Cool tones, blue-pink	
Late May— with Lilacs and Leucothoe	Pinxter-flower (<i>Rhododendron nudiflorum</i>)	5-6			white
	<i>Rhododendron nudiflorum</i> var. <i>roseum</i>	5-6		rosy pink	
	Chinese Azalea (<i>Rhododendron molle</i>)	5-6	salmon, red, orange		yellow
	Coast Azalea (<i>Rhododendron atlanticum</i>)	1½-2			white, pink
	Japanese Azalea (<i>Rhododendron japonicum</i>)	5-6	salmon, red		
	Carolina Rhododendron (<i>Rhododendron carolinianum</i>)	4-5		rosy pink	white
	Rhododendron Boule de Neige	4-5			white
	Rhododendron Atrosanguineum	6-8		crimson red	
	Rhododendron Everestianum	6-8		light purple	
Early June— with Mock- Oranges	Flame Azalea (<i>Rhododendron calendulaceum</i>)	5-7	orange, red		yellow
	Ghent hybrid Azaleas (<i>Rhododendron gandavense</i> vars.)	3-5	orange, salmon		white, yellow
	Mountain Rose Bay, or Catawba Rhododendron (<i>Rhododendron catawbiense</i>)	6-8		lilac	white
	Rhododendron Henrietta Sargent	5-6		pink	
	Rhododendron Lady Armstrong	6-8			light pink
Mid-June— with Mountain- Laurel	Rockmount Rhododendron (<i>Rhododendron arbutifolium</i>)	3-4			light pink
	Rhododendron Mrs. Charles Sargent	6-8		pink	
	Rhododendron Caractacus	10-15		crimson	
	Rhododendron Purpureum Elegans	6-8		dark purple	
Late June— with Lemoine Mock-Orange	Sweet Azalea (<i>Rhododendron arborescens</i>)	5-7			white
	Rose Bay (<i>Rhododendron maximum</i>)	10-15			white
Mid-July— with Sour-wood (<i>Oxydendrum</i>)	Swamp Azalea (<i>Rhododendron viscosum</i>)	5-7			white



NATURALIZED RHODODENDRONS

*For landscaping acres
of woodland*

John C. Parker

CONTRARY to popular impression, the Rhododendron (including the Azalea) is one of the easiest of flowering plants to use in landscaping, either on a small or on a large scale. Rhododendrons have a few cultural requirements on which they are quite "insistent." These are not difficult to provide; and granted them, the Rhododendron will pretty well take care of itself, and will also respond most "generously" to any little extra consideration that may be given to its "desires."

The rapidity of growth, the wide range of flower color, the astonishingly long season of bloom, the range of size and shape in the plants, and the distinctions in the foliage of the evergreen varieties, all make the Rhododendron a very fine plant for landscape purposes. In response to the popular belief that Rhododendrons are prohibitively expensive for use on a large scale, it must be emphasized that both evergreen and deciduous kinds can be had in a variety of sizes adapted to any purpose.

Small Plants

If one wishes to start with very small plants, he can grow them in quantity in nursery beds for a year or two, and then set them out in their approximately permanent places as soon as they are big enough to shift for themselves. I say "approximately permanent location"; and here is one of the places in which it is easy to go wrong. The plants should be set close enough together to get some degree of mutual protection without

crowding: the shade from one keeps the roots of its neighbors cool and moist; and growth goes on at a tremendous rate. In a surprisingly short time it is necessary to remove at least three plants out of every four. The removed plants are then set out (with a wider spacing, of course) elsewhere on the grounds. A delay of two or three years beyond the best time for removing will give some fine specimens, but also will run the moving into a major mechanical job.

Long Island

The glacier which crossed Long Island must have "had in mind" the requirements of Rhododendrons!—for it left conditions ideal for them. Here we have a considerable stretch of land, made up of rather porous, well-drained soil; the Atlantic Ocean on one side, and Long Island Sound on the other, supply a reasonably moist atmosphere and fairly well distributed precipitation. The winter humidity and the snowfall are important to the evergreen Rhododendrons, in minimizing evaporation from the leaves and in blanketing the earth against too deep penetration of frost. The glacier did particularly well by the North Shore; as it melted away, its water courses cut the whole region into a series of pockets shaded against the low-lying winter sun and having ample air drainage.

Planting

In setting out plants in our hilly, wooded area, the topsoil is carefully removed in a circle 3 or 4 feet across for each plant. Then subsoil is dug out and piled up on the downhill side of the excavation, so as to make a little crescent-shaped dam to catch the runoff of the rain. A generous supply of half-rotted leaves scraped from the neighborhood of

the hole is then dug into the subsoil. Some of the topsoil is replaced, and the plant (with its ball of earth) set. More topsoil is fed around the ball and pressed down with the feet; and enough more is raked in to bring the hole to its previous level. Then leaves are piled outside the circle of the excavation on the uphill side, and spaded in to the full depth of the shovel blade. This provides an easy entry for the rain water as it courses down the hill, even though the soil is not turned over in the spading. The hillside thus becomes a series of miniature terraces. The process sounds formidable in words, but it really is very simple.

Species and Varieties

Many people object to the Mountain Rose Bay (*Rhododendron catawbiense*) because it is magenta. But my Catawbias, collected as little seedlings in the Carolina Mountains, don't look at all bad to me. That may be because they are planted by themselves in a big sweep against the green background which the foliage of each plant provides for those below it on the slope.

Another of our native species which supplies extreme variety of interest is the Flame Azalea of the southern mountains (*Rhododendron calendulaceum*). My plants of this species, too, were collected stock, grown from chance seedlings. Some among them are gorgeously exciting, others are merely pleasant; but the pleasant ones at least provide a setting for the choicer ones.

Mass planting of collected stock is good on a large place. But on a smaller place, one should specialize in choicer kinds: some of the species, including our own good old standby, the Rose Bay (*Rhododendron maximum*), and our native pink and white Azaleas. Careful and discriminating selection of individual specimens is very important on a small place, because it is just as much work to take care of an inferior plant as a highly superior one.

For foliage effect, as well as for the high intrinsic quality of its bloom, there is probably nothing superior to the hybrids of *Rhododendron Fortunei*, particularly the strain developed by the late C. O. Dexter at Sandwich on Cape Cod, Massachusetts. To look down from an upper window on a bank of these *Rhododendrons*, when the long slanting rays of the early morning sun strike the dew-laden leaves and emphasize foliage shades running from glaucous green to exceedingly dark green, is a never-failing delight. The associated foliage of Mountain-Laurel makes an harmonious contrast, and gives a great deal of life to the planting. The white or nearly white blossoms of some of the Dexter hybrids and of the *Fortunei* species, as well as the blossoms of Mountain-Laurel and Pieris, have spectacular value under the moonlight—a factor not lightly to be dismissed in one's plantings.

Propagation

Chance crossings, particularly in the Dexter strain, result in an unbelievably wide range of shades and markings. It is not at all difficult to grow these from collected seeds from one's own plantings; and it is good fun to wait a few years to observe and to select from the variety of bloom.

Certain kinds are very "generous" in selfsowing, particularly if the minute seeds drop into protective banks of moss which grows very easily on the acid soil necessary to the members of the Heath Family. The Torch Azalea (*Rhododendron obtusum* var. *Kacmpferi*), the Flame Azalea (*Rhododendron calendulaceum*), the Royal Azalea (*Rhododendron Schlippenbachii*), the Rose Bay (*Rhododendron maximum*), the Mountain Rose Bay (*Rhododendron catawbiense*), and the Carolina *Rhododendron* (*Rhododendron carolinianum*) have been, with us, peculiarly prolific in selfsowing. The small plants can be collected—please restore the moss—and grown in the nursery for later selection.



A Fortunei hybrid Rhododendron with Dogwood and Hemlocks in the background

When one has something that he really prizes, it is not too difficult to take cuttings, at least of some varieties. Almost all kinds can be reproduced easily by layering; and in this way, of course, the characteristics of plant form, foliage, and flower are preserved [see page 13].

Companion Plants

There are many plants which may be associated with the Rhododendron for landscape purposes. One of the most important of these is the English Ivy (*Hedera Helix*), planted as a trailing ground cover. It is "happy" under the same conditions that "please" the Rho-

dodendron, and streams uphill at an astonishing rate. We find it necessary to cut it with a spade in order to keep paths clear; the scraps thus cut off are placed on bare spots on the hillsides, lightly pressed down, and left to themselves to root. An area covered with the dark glossy green of English Ivy makes a fine background for the rosy lavender blossoms of *Rhododendron mucronulatum* in the early spring. This large-blossomed Azalea does well with *Forsythia intermedia* var. *spectabilis*, which blooms at the same time; and it reaches a height of 6 to 8 feet in a very few years.

Of taller plants which can be grown in

association with Rhododendrons, one probably heads the list with two "Andromedas"—*Pieris floribunda* and *japonica*. Their early white blossoms and the ruddy color of the new foliage in the early spring, together with the graceful habit of the plants and the good color of their foliage, make them valuable for landscape material. Their close relative, Drooping Leucothoe (*Leucothoe Catesbei*), is invaluable as a foreground plant; its wine-colored foliage gives much life to the winter landscape.

The matter of foliage color and texture is of great importance in landscape

effects. In spite of the distribution of blooming times of different plants, there are more months of the year without blossoms than with them. The contrast in the various shades of green in these plants is greater than one would believe possible unless he had actually observed it; and the plants may be so disposed as to take full advantage of the variations in foliage color and texture.

Suggestions

We have been fortunate in the topography, the soil, and the tree cover of our place. The heavy cover of Oaks helps

One of the author's favorite naturalized plantings 11,851



in two ways. The decaying Oak leaves supply the acid humus favorable to the growth of Heath Family plants; and the rather crowded growth of the Oaks makes them tall, so that they provide very high light shade against the blistering glare of the summer noonday sun.

As a measure of the comparative ease of handling these plants, I might mention that our whole place is about ten acres. I have put in a lot of time and effort, myself, not only on the plantings but on other work around the grounds; and I have had one outside man—not a gardener—who helped with some of the digging, but very little with the planting. The Head of the Household has had a hand in some parts of the operations. During the war years there was no outside help on the place, and we had no time for our hobby. Since then the outside man has been busy restoring paths, and repairing storm damage to which attention could not be given at the time of occurrence. From the beginning, of course, he has had many activities besides those devoted to the several acres of Rhododendrons and Mountain-Laurel. On a

smaller place the necessary effort would, of course, be correspondingly smaller.

Doubtless there are locations in which the more delicate of the Rhododendrons cannot be grown. But providing proper windbreaks and the shade of taller-growing and hardier plants should make possible the introduction of many sensitive varieties even in less favorable locations. And the tougher varieties are by no means to be held in contempt. Similarly as to the soil, it is quite possible, by digging in sand and humus material, to provide good rooting conditions even on stiff soils.

Of all the planting material that I know, the Rhododendrons have outstanding merit. They should not be rejected on the assumption that they are difficult or expensive. They are less troublesome than most of the herbaceous perennials; and in pleasure and beauty they yield a high return on the investment, both of time and of cash outlay, whether on the small place or on the large one. I should put up a warning, however: don't start with Rhododendrons unless you are quite sure that you can restrain yourself from becoming an addict.

REFERENCE BOOKS ON RHODODENDRONS AND AZALEAS

Rhododendrons, an account of all species of the genus (including Azaleas), and the various hybrids, by J. G. Millais. 2 volumes. Published by Longmans, Green, and Co., New York, 1917 and 1924.

Rhododendrons for amateurs, by E. H. M. Cox. Published by Country Life, Ltd., London, England, 1924. (Charles Scribner's Sons, New York.)

Rhododendrons and Azaleas, their origins, cultivation, and development, by Clement Gray Bowers. Published by The Macmillan Co., New York, 1936.

The handbook of Rhododendrons, written and published by the University of Washington Arboretum Foundation, Seattle, Washington, 1946.

Azaleas, kinds and culture, by H. Harold Hume. Published by The Macmillan Co., New York, 1948.

Rhododendrons, Azaleas, Magnolias, Camellias, and ornamental Cherries, by A. T. Johnson, with notes on propagation by F. C. Puddle. Published by My Garden, London, England, 1948.

DEXTER HYBRID RHODODENDRONS

Something really fine—coming

Samuel A. Everitt

WHEN the late Charles O. Dexter selected *Rhododendron* culture and development (of both species and hybrids) for a major horticultural interest (in the early 1920's), he found Sandwich, on Cape Cod, Massachusetts, a good practical place for his years of absorbing work. He was apparently equally fortunate in procuring his original plants. He wrote to me: "All of my Fortunei hybrids came from the Farquhar collection [the Cape Cod nursery (at Osterville) of the R. & J. Farquhar Company of Boston], and these are decidedly the best and most interesting of all my original plants." To these were soon added, however, *Rhododendron decorum*, *discolor*, *Fargesii*, *Griffithianum*, and other species and hybrids; also *Rhododendron Griersonianum* and *haematodes*; and later, in the 1930's, several English hybrids of good color, such as *Britannia*, *Pygmalion*, *Mrs. Charles Butler*, and *Countess of Athlone*.

An example of his generosity is a letter to me, of July 19, 1937: "I have . . . a number of boxes of seedling *Rhododendrons* to spare . . . over a dozen boxes. If you would like any of these you are welcome to them, and I think you should send for them very soon, as . . . the plants should be set out in the open ground as soon as possible."

In Long Island Gardens

One outcome of this kindly gesture is the vigorous growth and magnificent bloom of hundreds of Fortunei and Azalea hybrids in two adjacent garden plots on the Long Island North Shore—Mr. John C. Parker's and mine. These two examples perhaps carry some special interest in Heath Family plants used in naturalistic gardening.

Among the factors contributing to the success of such a garden, mention may be made of the high shade of Oaks, protected valleys, appropriate undergrowth (with special appreciation of many varieties of ferns), good supply of Oak leaves and other accessible mulch, encouraging humidity, and frost drainage—altogether many factors in common with the Sandwich location from which many of our plants came.

Our selection of plants (with the favorable location) provides bloom of outstanding color and pattern for one third of the year. On April 1 the Snow Azalea (*Rhododendron mucronatum*) raises the curtain. Then comes the Big-leaf *Rhododendron* (*Rhododendron calophyllum*), with enormous flowers. The Five-leaf Azalea (*Rhododendron pentaphyllum*) appears at the same time—like a glorified Pinxter-flower (*Rhododendron nudiflorum*). Increasing flashes of color appear at overlapping intervals extending over a four-month period. The Royal Azalea (*Rhododendron Schlippenbachii*) is hardy, and when well grown, is of outstanding beauty. The Torch Azalea (*Rhododendron obtusum* var. *Kaempferi*), in varying stages of seedling growth, carries good bloom for more than a month. The Dexter *Rhododendron* hybrids bloom in succession all through May. The last *Rhododendron* bloom appears the end of July, when the Ear-leaf *Rhododendron* (*Rhododendron auriculatum*) comes into flower with a marvelous fragrance and a snowy display of flowers as large as Easter Lilies.

Among the choice Dexter Fortunei hybrid seedlings, we discovered a particularly beautiful one, with large, fragrant, yellow-apricot flowers. We wrote Mr. Dexter of our thought to name this plant for him. "No," was his reply, "I do not want a plant named for me whose full development I've not seen." And so this



Mattie Hewitt photo

Adelgas and Rhododendrons in the author's woodland garden, with ferns, Oaks, and Hemlocks

fine, early-blooming hybrid has gone on the records as "C.O.D." (for Charles O. Dexter—although most people would not understand the significance of the initials). Other named varieties include Peter Koster, Ashes of Roses, and Tan; but none of them has been introduced into the trade, as yet.

Collections

Collections of the Dexter hybrids are being kept at the original Sandwich plantation; also at the New York Botanical Garden, Bronx Park, New York; Swarthmore College, Swarthmore, Pennsylvania; the Morris Arboretum, Chestnut Hill, Philadelphia, Pennsylvania; the Arnold Arboretum, Jamaica Plain, Massachusetts; the University of Washington Arboretum, Seattle, Washington; and Mr. Henry F. Du Pont's place at Winterthur, Delaware.*

In the work with the Dexter hybrids we have had the assistance of Mr. George Gillies in the germination of seeds and the raising of young plants. Some of our seedlings have been sent to Swarthmore College, and have come under the interested care of Dr. John C. Wister.

The alertness of Dr. Clement G. Bowers in preserving as much as possible of Dexter's work, and Bowers' persistent and promising effort to increase the tolerance of the Dexter hybrids to wider variations of temperature, are a real contribution. Also important are the plans of Mr. Henry T. Skinner of the Morris Arboretum to see that some of the best varieties are described and introduced; likewise the active interest of David Ward, at Eureka, Oregon.

Characteristics

Any interested observer of the Dexter hybrids will note the harmonious colors of their flowers, and their excellent foliage which gives a display of olive-green

masses in the non-flowering period of the year.

A good many of the Dexter hybrids have flowers with seven petals, often frilled at the edges, and arranged in loose clusters which may not have a universal appeal. Yet this may be part of the individuality of the whole Dexter group of hybrids.

Mr. Paul Frost, landscape architect of Cambridge, Massachusetts, wrote of the Dexter Rhododendrons (four or five years ago) as "one of the finest products of an age of mass production . . . hundreds of exquisite fragrant Fortunei hybrids, 6 feet high and over, and destined to be much higher, while Haematodes crosses carry us quite beyond anything we have seen in America." It is certain that in this strain originated by Mr. Dexter we have Rhododendron blossoms of unusual fragrance, great size, and outstanding colors (ranging through apricot and soft tones of pink and pale yellow)—a development that must be perpetuated.

One of Dexter's Fortunei hybrid
Rhododendrons

Clement Bowers photo



* The modest author of this article has, on his own place near Huntington, Long Island, probably the best collection of Dexter hybrids outside of the Sandwich planting. He has cultivated and selected them with unusual care and skill.—Ed.

THE GLENN DALE HYBRID AZALEAS

Large-flowered and winter-hardy

B. Y. Morrison

THE Glenn Dale Azaleas, so called because they were originally bred (beginning in 1928) at the United States Plant Introduction Garden at Glenn Dale, Maryland, probably represent the largest Azalea breeding project undertaken in this country, although the number of years during which crosses were made is small. Some later work was done in the writer's own garden, at Takoma Park, D. C., and the seeds were carried to Glenn Dale as additions to the progenies under test.

The original object of the work was the production of clones that should be winter-hardy for our area (Maryland and Virginia) and should have flowers as

large as those familiar to all travelers through the old southern gardens. Since there was no literature on which to depend, a certain amount of exploratory work had to be undertaken, on the basis of whatever could be deduced or even surmised from the nature of the available parent material, in place of seasoned judgment.

Parents

The obvious winter-hardy Azaleas then available within the Obtusum subseries were Kaempfer's Azalea, or Torch Azalea (*Rhododendron obtusum* var. *Kaempferi*) and some of its hybrid progeny; the Korean Yodogawa Azalea (*Rhododendron yedoense* var. *poukhanense*); *Azalea macrantha* of the nurseries (*Rhododendron indicum*) in its several clones; the Snow Azalea (*Rhododendron mucronatum*) and its variants; and the Kurume

Glenn Dale hybrid Azalea Caprice

Robert Taylor photos



Azaleas, some of these latter more cold-resistant than the others. It was discovered that *Rhododendron pulchrum* var. *phoeniceum*, and its clone, Omurasaki, were reasonably hardy, as was also Maxwell's Azalea, belonging to the same species. With the single exception of the Korean Azalea, this was essentially the material available to the European worker in the middle eighties. The only other difference was a far wider range of Kurume Azaleas, thanks to many clones introduced from Japan by the Division of Plant Exploration and Introduction.

The winter-tender clones were those Azaleas from southern India, survivors of the great Azalea period of the same middle eighties, generally regarded as a mongrel race of unrecorded parentage. From a study of these commonly grown plants, two deductions can safely be made for this area: first, these Azaleas are not really mongrel, but fall roughly into two categories, those of obvious *Rhododendron indicum* type, and those of obvious *Rhododendron Simsii* derivation; second, they are by no means so sensitive to cold as had been believed.

Seedlings and Clones

By carefully planned combinations of tender and hardy parents, one of which was large-flowered, over 60,000 seedlings were raised and set out with care in beds carefully prepared in a thin oak wood that naturally supported ericaceous (Heath Family) plants. Excellent care was given the first summer, but very little thereafter; this was done purposely, in order that winter (with its regular zero weather and occasional subzero night) might weed out the weaklings. There were surprisingly few losses.

With regard to flowering, as might be surmised, there were some particularly felicitous combinations, and some that were uniformly disappointing. Some that did not attain the desired flower size were otherwise so excellent that they have been perpetuated.

Twenty years have passed, and only thirty clones have been released and propagated to the extent that they are on the retail market. More will follow now in rapid succession, so that the gardens of Maryland and Virginia can safely compete with those of the deep South. The timid souls, who want only the ten best of any kind of plant, are already alarmed; and well they may be, for the Glenn Dale Azaleas now in trade are but a small foretaste of what will presently be available. In time, gardeners in our area can choose their favorites, in almost any size, in almost any season from late March (in mild springs) to mid-June. Not all colors are available as yet in all groups, nor are there many double-flowering clones, although hose-in-hose types are represented freely. Far less than 1 per cent of the total population will ever reach the nurseryman's hands; surely this is modest enough.

The Glenn Dale project has given the Azaleas of the Obtusum subseries a wider and more highly varied advance than has been given any other group of shrubs except Roses. This advance has been made possible not solely by the planning and work of the writer, but through the active encouragement and participation of all of his colleagues at the United States Plant Introduction Garden.

Azalea Mme. Dominique Vervaene, of
Rhododendron Simsii derivation



PESTS AND DISEASES OF AZALEAS AND RHODODENDRONS

And how to control them

Cynthia Westcott

Insect Pests

Sucking insects. Azaleas and Rhododendrons grown in full sun are almost invariably attacked by lace bugs. There are two species of these sucking insects. The Rhododendron lace bug (*Stephanitis Rhododendri*) infests also Azalea, and frequently Mountain-Laurel and Pieris. Small flat nymphs, with dark spines and light and dark bands, hatch in late May or early June from eggs wintered along the midribs of the leaves. They feed always on the undersides of leaves, covering them with brown varnish-like bits of excrement. Loss of sap disfigures the upper leaf surfaces into a stippled yellow or grayish effect. During June the nymphs change into adults (about $\frac{1}{8}$ inch long, with beautiful lacy wings), which lay eggs for a second generation—to ap-

pear in July. The best control measure is spraying in early June with nicotine sulfate and soap ($1\frac{1}{2}$ teaspoons of Black Leaf 40 and 1 ounce of soap to a gallon of water), or any rotenone-pyrethrum combination; this spraying should be repeated in ten days, if necessary. The spray must be applied with force, and must cover the undersurface of the foliage thoroughly. An incomplete job necessitates a third application for the July brood.

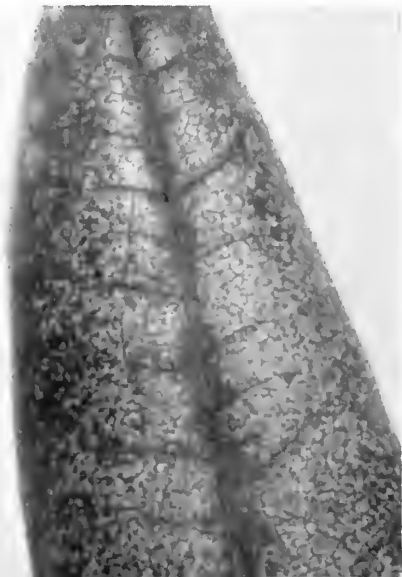
The Azalea lace bug (*Stephanitis pyrioides*) is similar; but it may have more than two overlapping broods which build up to a dense population by late summer; and so it is much more difficult to control. At the Brooklyn Botanic Garden and in most suburban gardens last summer, this lace bug was unusually prevalent, turning the foliage of evergreen Azaleas coffee-colored, even when the usual sprays were applied.

I think I had some success in killing lace bugs with tetraethyl pyrophosphate (using the form sold as Vapotone); but I am not so sure about that as I am of the value of this new chemical for the white flies which seem to be always present on evergreen white Azaleas. They do not do much harm, but they are a nuisance; and I have never before had much luck in getting rid of them. This material is extremely poisonous to humans, and must be used with great caution.

In southern gardens a number of other sucking pests take their toll. Peony scale forms little bumps on the bark, leaving a white scar when scraped off. It kills twigs and branches, and greatly reduces vitality. Azalea mealy bugs, with their white cottony coverings, cluster around branch forks, and are accompanied by ugly black sooty mold, a fungus living

Leaf showing injury by Rhododendron
lace bug

Author photos



in the insect's honeydew. Needle-thin thrips turn leaves silvery, with their rasping; and red spider and rust mites turn foliage reddish brown. The standard spray program in the South, for lace bugs and these additional enemies, calls for a summer oil, such as Volck, at a 1-to-60 dilution (1-to-100 for a Florida Volck), with a teaspoon of nicotine sulfate and two tablespoons of powdered derris (if you can get it) per gallon. Spray right after blooming, and again at the end of May; and make the third and last application in late September.

Borers are perhaps the commonest of the chewing insects, at least in the suburban New York area. The Rhododendron borer (*Ramosia Rhododendri*) is a white grub (an inch long when full-grown) which changes to a clear-wing moth. Its eggs are laid in late spring on the main stem or larger limbs; the young larvae feed first in the cambium layer just under the bark, and later burrow on into the wood, pushing their borings out through holes in the trunk.

The Azalea-stem borer (*Oberca tri-punctata*), now known officially as the Dogwood twig borer, is a grayish-yellow beetle which works likewise in Rhododendron, Blueberry, Mountain-Laurel, and Elm. It girdles twigs by its egg-laying, so that there is a dieback of young shoots. The yellow grub bores down the twig and then down the trunk, pushing sawdust out from holes near the ground. It may live for two or three years as a grub before pupating. To control borers, cut out all dead and dying twigs and branches. Watch for holes with protruding sawdust; if you work quickly you may kill the borer in place with a wire, or nicotine paste, or carbon bisulfide, and save the main trunk.

Leaf-eating insects are not too important. Canker worms, and tent caterpillars sometimes stop to take a few bites on their way down out of trees; black vine weevils sometimes chew notches from the edges of Rhododendron leaves; and the Cranberry rootworms may cut

crenate-shaped or angular holes. The last two work at night. In some localities, Asiatic garden beetles feed on leaves; and Japanese beetles, in sections where they are numerous, may chew Azalea foliage to lace. Either lead arsenate or DDT can be used, but I seldom find such control measures necessary or desirable. The Azalea leaf miner, which feeds on, lives in, and rolls leaves, is found in greenhouses oftener than outdoors; and there it can be fought with the new aerosol bombs.

Diseases

Environment is often more to blame for "unhappy-looking" Rhododendron specimens than disease-producing organisms. Yellow leaves may be due to unavailability of iron in a too alkaline soil, and can be corrected by the addition of sulfur and perhaps a little aluminum sulfate to the soil. Large brown blotches appear on the leaves when early spring sun and strong winds evaporate water from the foliage faster than it can be drawn up from the roots. Fungi then come in secondarily on this injured tissue. Windbreaks, mulches, and thorough soil watering in late autumn, are all helpful.

Scorch, leaf spots, mildew, leaf gall. Azaleas are readily scorched when the

Rhododendron leaf showing iron deficiency



temperature soars in midsummer; but there is also a fungus disease known as scorch (caused by *Septoria Azaleae*), as well as a variety of leaf spots which flourish in a wet season. In 1948 our spring and early summer were much too wet; the results were leaf-spotting and some defoliation of many deciduous Azaleas. In late summer, high temperature and drought resulted in browning and dropping of many more leaves. Such foliage as was left was taken over by lace bugs, and by powdery mildew (*Microsphaera Alni*), the same one that grows on Lilacs. In a normal season, fungicides would have been unnecessary; in 1948 spraying with weak Bordeaux mixture (2-2-50) would probably have been helpful. A low-lime Bordeaux mixture (2-1-50) has been suggested for the control of *Exobasidium* leaf gall, which is a gross enlarging and thickening; but in most cases it is enough to cut off and burn galls as they are found.

Bud blight. Known particularly in Massachusetts is a bud blight or blast (due to *Briosis Azaleae*) which kills terminal flower buds in midsummer; the result of this is little or no bloom the next season, and sometimes the death of the plants. Prune out and burn dead twigs, spray with Bordeaux mixture, or dust with copper-lime dust.

Wilt diseases. Rhododendrons have two or three wilt diseases; the most important is chiefly a nursery problem, of grafted plants under 3 years. Proper soil acidity, good drainage, and removal of infected specimens, all help combat the

Azalea leaf gall near tip of branch



Azalea flower with upper petal showing initial spotting of the disease, petal blight

Map showing the rapid spread of petal blight since 1931



soil-borne fungus (*Phytophthora cam-bivora*). A related fungus (*Phytophthora Cactorum*) causes foliage blotch, stem cankers, general dieback, and wilt of both Rhododendrons and Lilacs. Control measures call for keeping these two kinds of plants separated. Their soil "preferences" are so widely different that this advice seems unnecessary; yet I have visited gardens where Lilacs and Rhododendrons were alternated all along a border.

Flower Spot. The most spectacularly devastating disease I have yet encountered is Azalea flower spot or petal blight (caused by *Oeculinia Azaleae*). Apparently an enemy from Japan, it was first noted in the lovely Charleston gar-



Unsprayed Azalea with all flowers ruined by petal blight

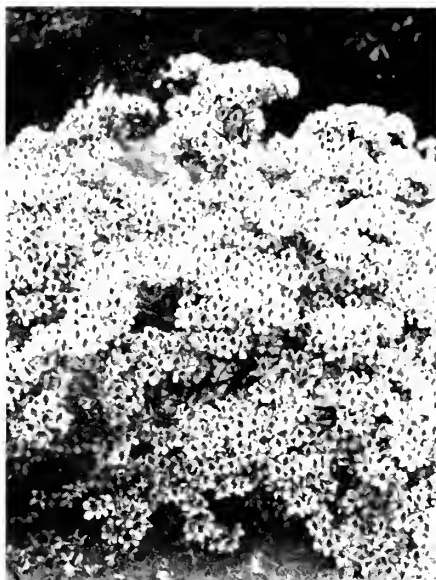
dens in 1931. It quickly spread to North Carolina; south along the coast to Georgia and Florida; along the Gulf to Alabama, Louisiana, Mississippi, and Texas; and in some way it reached California by 1941. It was known in Maryland by 1945, and was reported from Virginia in 1947. We certainly hope that our northern winters will keep it from getting established here; but the fungus attacks the Kurume as well as the Indian varieties, and so we should keep our fingers crossed.

The rapid action of this fungus, given high humidity and moderate temperature, has to be seen to be believed. One day flowers seem perfect; the next, a bit rain-spotted; and by the third day all the millions of blossoms on the thousands of bushes in a whole town will have collapsed simultaneously to a slimy mush. Decayed flowers do not fall normally, but hang for months in unsightly brown masses. Black, hard resting bodies (*sclerotia*) formed at the bases of petals and then dropped to the ground, provide for overwintering; in the spring these resting bodies send up minute fruiting structures (*apothecia*), whence spores are puffed up to low-hanging blossoms. After this initial infection, summer spores

(*conidia*) are produced in quantity over the inner petal surfaces, and are spread from plant to plant by insects, people, wind, and rain. This enormous secondary infection coincides with the height of bloom of midseason varieties in the deep South.

Sanitary measures proved of no help; but a spraying program, carried out often enough to keep opening petal surfaces protected (about three times a week), gives practical control and lengthens the blooming period of the great show gardens by as much as a month or six weeks. The formula that has been used successfully since 1945 calls for 1½ quarts of liquid Dithane D-14, 1 pound of 25 per cent flake zinc sulfate, ½ pound of hydrated lime, and 1 ounce of spreader B 1956 (Dreft can be substituted for the last) to 100 gallons of water. In some towns, householders are getting together to have custom spraying done with power sprayers according to this formula. Gardeners who do their own spraying can get kits with small amounts of these materials and directions for use. Easier to mix are the more recent powders, Dithane Z78 and Parzate, both of which are zinc ethylene and bisdithiocarbamate and approximate the chemical formed by mixing liquid Dithane and zinc sulfate.

Azalea of the same variety (as shown at top of page), sprayed with Dithane



WITHIN THE BROOKLYN BOTANIC GARDEN

BOTANIC GARDEN WEEK

Plans for the second annual Brooklyn Botanic Garden Week, scheduled for Cherry Blossom Time, May 1 to 8, are well under way.

Highlights of the special week, which last year attracted more than 95,000 visitors, include the following events:

An eastern conference on The Place of Community Gardens in Child Development, to be followed, the next day, by a demonstration in the Children's Garden.

The Use and Care of Dwarf Trees and Shrubs: an educational program for both garden club representatives and nurserymen.

Members Day: an open house, planned to show members how the Garden operates, followed by conducted tours through Cherry Lane.

Botanic Dinner: exotic plant dishes to whet the appetite of the most exacting gourmet.

May Day Festival: a pageant, to be staged by school children in Cherry Blossom Esplanade, to open the week's events.



Cherry Blossom Queen Jean Blake at the Brooklyn Botanic Garden, May, 1948

TOUR OF LONG ISLAND ESTATES

Scheduled for May 17

Members of the Garden are invited to visit outstanding private gardens on Long Island. Included in the itinerary are: "Munnysunk," at Locust Valley, home of Mr. and Mrs. Frank Bailey; "High Lindens," at Huntington, home of Mr. and Mrs. Thomas H. Roulston; and "Planting Fields," at Locust Valley, home of Mr. and Mrs. W. R. Coe.

The trip is scheduled for May 17, but

will be postponed to May 18 in case of rain. Buses will leave the Garden at 9 A.M., and return about 5 P.M.

Inquiries and reservations should be made in writing to

Matthew A. Bassity
Curator of Public Information
Brooklyn Botanic Garden
Brooklyn 25, New York.

GAGER MEMORIAL PLAQUE

A bronze plaque, commemorating the thirty-three years' service of the late Dr. C. Stuart Gager, the first Director of the Garden, was unveiled December 21,

1948, in the Library, at a ceremony attended by trustees, staff, and special friends. Details will appear in the 1948-49 annual report.

BROOKLYN BOTANIC GARDEN

OF

THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES

Officers of the Institute

ADRIAN VAN SINDEREN
President

SIDNEY W. DAVIDSON
First Vice-President

CHARLES PRATT
Second Vice-President

ROBERT E. BLUM
Third Vice-President

EDWIN P. MAYNARD
Treasurer

DONALD G. C. SINCLAIR
Secretary

Ex Officio Members of the Board

The Following Officials of the City of New York

THE MAYOR THE COMPTROLLER
THE COMMISSIONER OF PARKS

Botanic Garden Governing Committee

LEONARD P. MOORE, *Chairman*

MISS HILDA LOINES, *Vice-Chairman*

WILLIAM G. CREAMER

EDWIN P. MAYNARD

LEWIS L. FAWCETT

ROBERT MOSES, *Ex officio*

MRS. LEWIS W. FRANCIS

JOHN C. PARKER

ANDREW J. GONNOUD

RUTHERFORD PLATT

WALTER HAMMITT

MRS. THOMAS H. ROULSTON

WILLIAM T. HUNTER

DONALD G. C. SINCLAIR

BERNARD H. SMITH

ADRIAN VAN SINDEREN, *Ex officio*

Director of the Botanic Garden

GEORGE S. AVERY, JR.

TO VISITORS

To reach the Garden:

By SUBWAY: from Manhattan, twenty-five to thirty minutes' ride from Times Square or Grand Central.

I.R.T., West Side (7th Avenue or Broadway-7th Avenue line), downtown express marked "New Lots Avenue" or "Flatbush Avenue," to Eastern Parkway-Brooklyn Museum Station.

I.R.T., East Side (Lexington Avenue line), downtown express marked "New Lots Avenue" or "Utica Avenue" or "Atlantic Avenue," to Nevins Street, step across platform and change to 7th Avenue or Broadway-7th Avenue train, ride to Eastern Parkway-Brooklyn Museum Station.

B.M.T., Brighton Beach line, downtown express or local to Prospect Park Station.

By AUTOMOBILE:

From Long Island, take Eastern Parkway westward, and turn left at Washington Avenue.

From Manhattan, take Manhattan Bridge, follow Flatbush Avenue Extension and Flatbush Avenue to Eastern Parkway; follow the Parkway to Washington Avenue, then turn right.

PLANTS & GARDENS

Summer, 1949

Lilies

Kinds and Culture

Use in the Garden

Lily Relatives

Lilies that Are Not Lilies

Plan of a Garden



AMONG THE CONTRIBUTORS TO THIS ISSUE

PHILIP BRIERLEY, a plant pathologist, working with diseases of ornamental plants at the Plant Industry Station of the United States Department of Agriculture at Beltsville, Maryland.

S. L. EMSWELLER, in charge of research work with ornamental plants at the Plant Industry Station of the United States Department of Agriculture at Beltsville, Maryland.

HELEN M. FOX (Mrs. Mortimer J.) of Peekskill, New York, an amateur gardener and author of several books on horticultural subjects (including *Garden Cinderellas*, a book on Lilies now out of print).

WILLIAM E. JORDAN, Librarian of the Brooklyn Botanic Garden.

GEORGE H. M. LAWRENCE, a botanist specializing in cultivated plants at the Bailey Hortorium of Cornell University, Ithaca, New York.

CONRAD B. LINK, Professor of Floriculture at the University of Maryland, College Park, Maryland.

L. H. MACDANIELS, head of the Department of Floriculture and Ornamental Horticulture at Cornell University, and President of the North American Lily Society.

ALAN MACNEIL of North Springfield, Vermont, proprietor of the Lily nursery, "Sandyloam," and co-author of the book *Garden Lilies*.

ISABELLA PRESTON of Georgetown, Ontario, originator of many hybrid Lilies, and author of books on their culture; formerly assistant in Ornamental Plant Breeding, Central Experimental Farm, Ottawa, Ontario.

PHILIP LUTHER ROBINSON, a practicing landscape architect at Great Neck, Long Island.

NEIL W. STUART, a plant physiologist working on problems of Lily propagation and nutrition at the Plant Industry Station of the United States Department of Agriculture at Beltsville, Maryland.

PLANTS & GARDENS



Tulipa Batalinii

Vol. 5

Summer, 1949

No. 2

CONTENTS

Cover—Wood Lily (<i>Lilium philadelphicum</i>), a native American Lily (McFarland photo)	
Among the Contributors to this Issue	Page 2 of Cover
Frontispiece	Madonna Lilies arranged to give architectural dignity to a garden 66
Director's Letter	67
<i>Articles on Lilies</i>	
How to Grow Lilies	George L. Slate 68
Where Lilies Grow Wild	73
Reliable Lilies for the Garden	George L. Slate 74
Garden Pictures with Lilies	Helen M. Fox 80
Lilies for the Rock Garden	85
New Garden Lilies	Alan Macneil 86
Wild Lilies of the Eastern United States	L. H. MacDaniels 90
Notes on Propagating Lilies	Neil W. Stuart 93
Diseases in the Lily Garden	Philip Brierley 98
How to Breed New Lilies	S. L. Emsweller 102
Lily Crosses	George L. Slate 105
Guide to Blooming Dates of Lilies	Alan and Esther Macneil 106
Peter Hanson of Brooklyn	William E. Jordan 108
What Is a Lily?	George H. M. Lawrence 110
<i>Articles of General Interest</i>	
Lilies That Are Not Lilies	Conrad B. Link 118
Enlarging the Garden	Philip Luther Robinson 122
Midsummer Flowers	Isabella Preston 126
Within the Brooklyn Botanic Garden	128

Except where otherwise credited, drawings by Michalena L. Carroll

GEORGE L. SLATE, *Guest Editor*

MICHALENA L. CARROLL AND HESTER M. RUSK, *Assistant Editors*

Published quarterly at Prince and Lemon Streets, Lancaster, Pa., by the Brooklyn Botanic Garden, Brooklyn, N. Y.
Entered as second-class matter, May 26, 1945, at the post-office at Lancaster, Pa., under Act of August 24, 1912.
Subscription included in Botanic Garden membership dues. To others: \$2.00 per year; \$3.50 for two years.

Copyright, 1949, by the Brooklyn Botanic Garden

ALL CORRESPONDENCE SHOULD BE ADDRESSED TO:
BROOKLYN BOTANIC GARDEN, BROOKLYN 25, N. Y.



McFarland photo

Madonna Lilies arranged to give architectural dignity to a garden

Except where otherwise credited, photos by Louis Buhle

THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES
BROOKLYN BOTANIC GARDEN
1000 WASHINGTON AVENUE
BROOKLYN 25, NEW YORK
TELEPHONE: MAIN 2-4453

Summer 1949

To Readers of PLANTS & GARDENS:

As this is written, the Wood Lily and other Lilies native to the northeastern United States are in bloom here in the Garden. Also in flower are nearly twenty hybrids, whose parents have come from many parts of the world. Unusually warm, dry summer days have hurried them into flower a bit ahead of their usual schedule.

Here is something to ponder: of the approximately five hundred thousand different kinds of plants that grow "wild" on the earth, fewer than one hundred are Lilies - so far as we now know. This means that about one species out of five thousand rightfully bears the Lily name. A good many more are commonly called Lilies, but cannot be classified with the Lilies at all (pages 110 and 118). Yet almost everyone knows a Lily, whether he knows plants generally, or not. Perhaps the reason is that one kind of Lily or another grows in the wild across the continents of North America, Europe, and Asia, down to the tip of India and the Malay Peninsula. Japan and the Philippines have their share of wild Lilies, too, yet Australia, Africa, and South America boast not one.

About eighty years ago, nearly fifty years before the Brooklyn Botanic Garden came into being, one of the world's finest living collections of Lilies was assembled here in Brooklyn by one Peter Hanson, whose name is perpetuated in Lilium Hansonii (page 108).

Make your Lily plans this summer while there are Lilies to be seen. In this region Lilies bloom from late May to September - a wide choice for the amateur or professional horticulturist.

Our Guest Editor for this Lily-feature issue is Mr. George L. Slate of the Agricultural Experiment Station at Geneva, New York. He is also the Editor of the Lily Yearbook of the North American Lily Society. Mr. Slate and the authors he has chosen speak with authority on this magnificent group of plants; it is a pleasure to welcome them to the pages of PLANTS & GARDENS.

The autumn issue of PLANTS & GARDENS will feature dwarf trees and shrubs. The Editor: Mr. Henry Teuscher, Curator of the Montreal Botanical Garden.

Sincerely yours,



Director

HOW TO GROW LILIES

Planting and care

George L. Slate

LILIES have long had the reputation of being difficult garden plants. For many kinds this reputation has been deserved, and garden literature is full of accounts of failures with Lilies. Usually the soil or the weather has been blamed. During the last thirty years the plant pathologists have discovered that three diseases, mosaic, Botrytis blight, and basal rot, have been responsible for many of the failures in Lily culture. Recent research has made it possible to control these diseases.

On page 98 of this issue Philip Brierley discusses the control of Lily diseases. When all who are concerned with Lily growing have made full use of the available information on disease control, Lilies will come into their own as the finest of garden plants.

Lilies in nature grow under a wide range of conditions. Soils, latitude, altitude, day length, winter and summer temperatures, rainfall, snow cover, and associated plants vary tremendously throughout the extensive range of the Lily. Lilies are found throughout the Northern Hemisphere, except in regions of low rainfall and in the tropics near the equator. It is not surprising, then, that when Lilies from many different regions of the world are brought together in a garden, some of them may fail. It is more surprising, perhaps, that many of them succeed.

Site

A suitable site, or place to grow the Lilies, is essential. The average gardener, with a small lot, has little choice as to where he shall grow his Lilies; but in a large garden some places may be better

than others. Good air circulation is desirable; this may be found in an open situation, or on a slope. Botrytis blight is less troublesome where moving air hastens the drying of the foliage after a rain. Frosts, too, are less serious on a slope. In frost pockets, particularly in places that warm up early in the spring, the Regal Lily and some of its relatives may be cut down by late frosts. For types that are easily frosted, north slopes, or the north sides of buildings are preferred sites.

All Lilies grow well in the sun; but light shade in the middle of the day is beneficial, and lessens the fading of the colors. The flowers of *Lilium Hansonii* and its hybrids, and *Lilium Henryi* are especially apt to fade in the hot midsummer sun. The Turks-cap Lilies (*Lilium Martagon* and its varieties) also are good in the shade. (See illustrations in color.)

Soil

A great deal has been written about soils for Lilies; but much of this information is valueless, because success and failure are usually determined by disease rather than by soil. Past observations on failures with Lilies did not take disease into account. If the plants died, the soil was supposed to be unsuitable; if they thrived, the soil was considered right. Nevertheless, the soil is important; and if it is not suitable, it may be modified by various treatments. Generally these treatments are such as would improve the soil for any of the common garden flowers and vegetables.

Source. The soil must not be what the contractor dug out of the cellar hole and spread over the surface in grading operations. Soils of this type should be replaced by something better if Lilies are to be grown. Any garden soil that will grow good vegetables or the general run



McFarland photo

Nankeen Lily (*Lilium testaceum*)

of annuals and perennials will grow good Lilies if it is well drained and in good physical condition.

Drainage is perhaps most important: Lilies do not tolerate "wet feet"; they perform poorly, or soon die out in poorly drained situations. If the drainage is not naturally good, the garden should be tiled; or (for small beds) it may suffice to mound up the soil to a height of a foot, or less, depending on the size of the bed. Digging out beds and filling in underneath with crushed rock or gravel is not satisfactory unless the hole goes through the impervious soil to a porous layer beneath.

Texture is not very important, except that coarse sands and gravels are more subject to drought than finer soils; watering, mulching, and the addition of organic matter will help to correct this. Stiff clays are not well aerated and may have poor drainage. The addition of coarse sand will somewhat improve the texture. The ideal soil is a medium loam, well supplied with organic matter.

Acidity. It has not been proved experimentally that the acidity of a soil matters greatly in Lily growing; but some authorities suggest Lilies for acid soils, and others, for alkaline soils. In my experience, some Lilies are chlorotic (that is, the green coloring matter fades out between the veins of the leaves) on a soil with a pH of 7.0 or higher. This trouble has been partially corrected by spading in a considerable amount of acid peat. Lilies that are chlorotic on high lime soil are *Lilium Hansonii* and some of its hybrids, the Showy Japanese Lily (*Lilium speciosum*), the Meadow Lily (*Lilium canadense*), the American Turks-cap Lily (*Lilium superbum*), and *Lilium Broxenii* var. *colchesteri*. Presumably these would be "happier" on acid soils. Lilies that do well on limestone soils are the Europeans, the Madonna Lily (*Lilium candidum*), and the Scarlet Turks-cap Lily (*Lilium chalcedonicum*), their hybrid the Nankeen Lily (*Lilium testaceum*).

the Orange Lily (*Lilium bulbiferum* var. *croceum*), and the Turks-cap Lilies.

Organic matter. Lilies in nature grow in soils high in organic matter. In the garden, especially in soils that have long been cultivated, the supply of organic matter may be low. The beneficial effects of organic matter are well known to gardeners; and Lily soils should be well supplied with this material. It may be had from various sources, all of them good. Spading or plowing under a green manure crop or an old sod, and turning under compost or well-rotted manure, are excellent means of adding organic matter to the soil. When manure is used it should be old, or else should be added a year before the Lilies are planted. Fresh manure should never be used with Lilies: it may stimulate the growth of the fungus that causes basal rot—with disastrous results to the Lilies. Peat is also a good source of organic matter for the native and Asiatic Lilies; but it is not suitable for the Madonna Lily. Leaf mold is one of the best materials for improving the soil.

Mulches and Fertilizers

During the first winter a mulch of straw, marsh hay, peat-moss, or sawdust will prevent the little bulbs from being heaved out of the soil by frost action when there is no snow cover. Straw or hay is removed in the spring; but peat or sawdust may remain, to serve as a summer mulch.

Summer care consists chiefly of keeping ahead of the weeds. The hoe should be used carefully; otherwise it may injure the stem roots, which are near the surface, and the stems of certain kinds of Lilies, which may wander about for several inches just under the surface before assuming an erect position. *Lilium Willmottiae* (*Lilium Davidii* var. *Willmottiae*) and *Lilium Duchartrei* possess wandering stems.

Providing a summer mulch is the ideal method of managing the soil. The mulch



McFarland photo

Orange Lily (*Lilium bulbiferum* var. *croceum*)

keeps down weeds, conserves moisture, prevents root injury from cultivation, and keeps soil temperatures lower. For this purpose peat-moss, sawdust, lawn clippings, and other similar materials are suitable. A depth of 2 or 3 inches is sufficient, and the mulch will need replenishing each year. During a drought, watering may be needed, especially for the late-blooming Lilies. The ground should be soaked to a depth of 6 inches or more, about once a week during the dry spell.

Lilies respond to high fertility in the soil as do other garden plants. Chemical fertilizers (although frowned on by some) are good sources of plant nutrients for Lilies. The 5-10-5 formula is as generally available as any, but formulas sold for potatoes are also good. The fertilizer may be broadcast over the beds in early spring at the rate of 2 pounds to 100 square feet, or a small handful scattered around each plant as it is coming up. If a sawdust mulch is used on infertile soils, an additional application of fertilizer (preferably nitrate of soda or sulfate of ammonia) may be necessary in midsummer, especially if the foliage becomes yellow.

Bulbs

The quality of the Lily bulb is important in the success of the planting. A good Lily bulb is virus-free, sound, and plump, and without traces of basal rot or mold. Freshly dug bulbs (with their roots) are superior to bulbs long out of the ground; but in many cases only the latter are available, and these (if virus-free) often perform satisfactorily. Seedling bulbs, if grown away from virus-in-

fectured stocks, are usually healthy. Collected wild bulbs are healthy, too.

Planting Time and Depth

Lilies are generally planted in the fall, as soon as the bulbs are available. Early fall planting allows a longer period of root growth before winter—a possible factor in successful wintering. The Madonna Lily should be planted in August, so that there will be time for the autumn rosette of leaves to grow. Spring-planted bulbs of some of the more robust Asiatic types will perform fairly well if the bulbs are sound and plump.

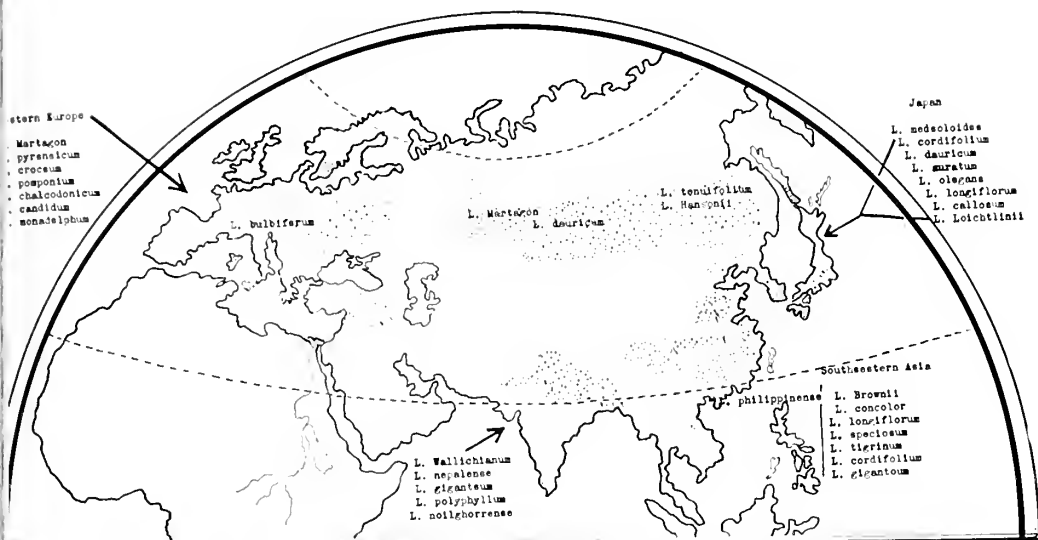
Planting depth varies somewhat with the soil and the species. The Madonna Lily should not be over 2 inches deep (to the top of the bulb); and the top of the bulb of *Lilium giganteum* should be at the surface of the ground. On sandy soils the bulbs of many Lilies may be slightly deeper than on heavy clay soils. Generally the taller and more vigorous species may be planted deeper than the less vigorous types. For most Lilies a planting depth of about 6 inches is suitable. Small seedlings, of course, should be much nearer the surface; and 2-year-old bulbs should be not much deeper than 2 inches.

In making garden pictures, Lilies are better in colonies of three to six or more plants, rather than as single specimens scattered about. Enough space (18 inches, at least, for the larger kinds) should be left between plants so that each stem may sway gently in the breeze without becoming entangled with its fellows. Lilies are stately, graceful plants that need plenty of room to display their charms.

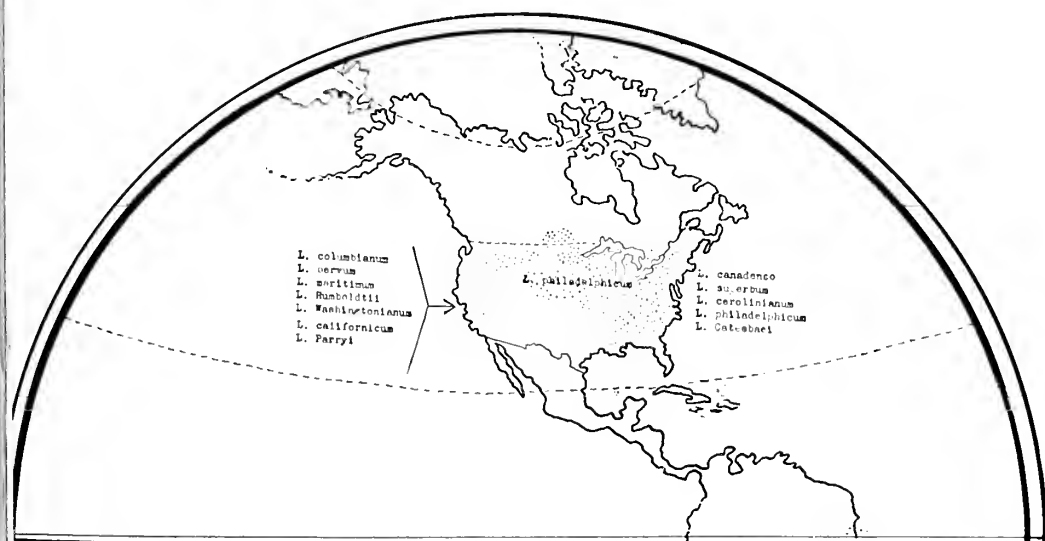
OTHER ARTICLES ON LILIES in *Plants & Gardens*

Some hybrids of *Lilium Willmottiae*, by F. L. Skinner. Autumn, 1946, pages 185-186.
 The Regal Lily, by Conrad B. Link. Autumn, 1947, page 161.
 Lilies for every garden, by Alan Macneil. Autumn, 1947, pages 162-166.

WHERE LILIES GROW WILD THROUGHOUT THE WORLD



Maps of Northern Hemisphere (adapted from *The Genus Lilium*, by Henry John Elwes), showing distribution of Lilies in Europe, Asia, and the New World. Dotted areas show where Lilies are native.



RELIABLE LILIES

Hardy, stately, and beautiful

THE ornamental qualities of Lilies give them top rank among hardy garden plants. In beauty of color, in diversity and attractiveness of form, and in stateliness of habit, Lilies are unsurpassed. They are hardy, and can remain

in the ground from year to year. From late May until October at least one kind is in bloom; and several kinds flower in midsummer, when there is a paucity of bloom in the perennial garden. In June and early July, and again in August, there are many kinds in flower.

About seventy-five species are known; but not all are in cultivation, and some are not easy to grow. Many variants of the species are available, some of them superior to their parents. Numerous excellent hybrids have been introduced at various times in the past, but only a few have survived. During the last twenty-five years the rate of production of new Lilies has increased tremendously. Variants of wild Lilies are being sought out and introduced, seedling strains involving several species are in large-scale production, and many new hybrid clones have been introduced. Many more are in the offing, and will make their debut as soon as sufficient bulbs have been propagated.

Types

Garden Lilies fall into several natural groups based upon the structure of the flowers; and the Lilies in each group are very different from the Lilies in the other groups. The trumpet Lilies, typified by the Regal Lily (*Lilium regale*), have large funnel-shaped flowers; the erect-flowered kinds, typified by *Lilium umbellatum*, have cup-shaped flowers facing up; while the Martagons, or Turks-caps, represented by the American Turks-cap Lily (*Lilium superbum*), have nodding flowers with reflexed segments. The open-flowered Lilies are represented only by the Goldband Lily (*Lilium auratum*). Another group (not commonly grown) has narrow funnel-shaped flowers and large heart-shaped leaves, and is represented by *Lilium giganteum*. Hybrids



Photo courtesy of Mrs. M. J. Fox

Lilium cordifolium, same type as
Lilium giganteum

FOR THE GARDEN

By GEORGE L. SLATE

between different species and groups have flowers of varying types.

Trumpets

The trumpet Lilies make up a group of magnificent plants; and among them are several of the most beautiful of Lilies. The well-known Regal Lily, a native of western China, bears up to fifteen or twenty large white trumpets with yellow throats and rose-colored or whitish exteriors. The sturdy stems grow to 6 feet, under favorable conditions, and are clothed with narrow grass-like foliage. This Lily requires full sun. It should not be planted close to a building, because the stems lean towards the light; out in the open it stands erect.

Closely related to the Regal Lily is *Lilium Sargentiae*, larger and later, with cream-colored throat; it bears axillary bulbils (bulblets) that may be used for increase. Grandest of all the trumpet Lilies is *Lilium myriophyllum* (*sulphureum*), an August-blooming one; it sometimes grows to 9 feet in height and has 10-inch buds that open into the largest of trumpets, with sulphur-yellow interiors. This magnificent Lily is not commonly seen in gardens, but it is hardy at Geneva, New York, and is not difficult to grow. It is well to plant it 8 to 10 inches deep and mulch it in the winter, as its Burma home is much warmer than the northern United States. Lily breeders in Canada and on the west coast have introduced its desirable characteristics into seedling strains in combination with the Regal Lily and *Lilium Sargentiae*, and the Chinese White Lily (*Lilium leucanthum*), the fourth member of this particular group of trumpet Lilies; these strains may well become the most widely planted Lilies in this country. All of them have

the same cultural requirements and the same use in the garden as the Regal Lily.

The well-known Easter Lily (*Lilium longiflorum*) is known to all as a pot plant at Easter time; but as a garden plant its possibilities have been overlooked. I have had seedlings of the Easter Lily outdoors for a number of



McFarland photo

Lilium formosanum



*Lilium
umbellatum*

McFarland photo

years at Geneva, and consider it a first-class garden Lily of great beauty and easy culture. For the time being, one should raise this Lily from seeds, to avoid the viruses present in some clones.

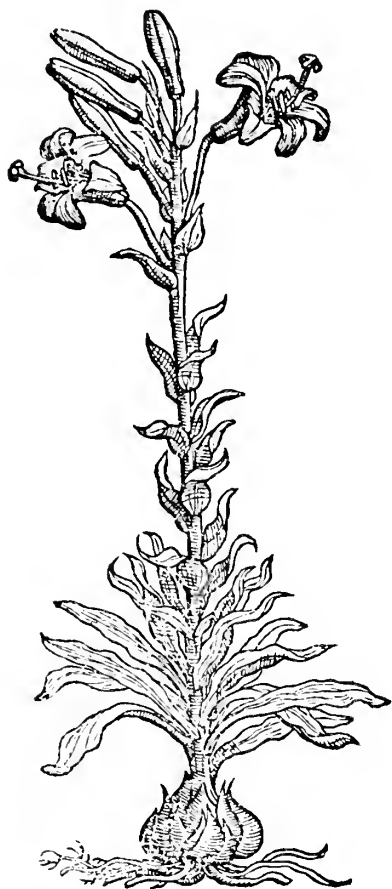
The Formosa Lily (*Lilium formosum*) is attracting a considerable amount of attention now, and many seedling bulbs are being marketed. Its beautiful white trumpets are a feature of the autumn garden. Full sun and any good garden soil suit it. If its flowers split and hang in shreds, the plants have mosaic and should be discarded.

Lilium Brownii and its variety *colchesteri* are beautiful July-blooming Lilies, but are susceptible to virus, basal

rot, and Botrytis blight. When healthy, they are very beautiful. Also very beautiful and often planted, but rarely persisting long in gardens, are the dwarfish pink *Lilium rubellum* and *Lilium japonicum*. A plant doctor would ascribe their demise to virus or basal rot. (See the article on Lily diseases on page 98.)

One of the oldest of all garden plants and one of the most popular is the handsome Madonna Lily (*Lilium candidum*). A thriving colony of this pure white, stately Lily is a treasure in any garden. When it "sulks," basal rot, Botrytis blight, or virus may be suspected. Shallow planting (2 inches to the top of the bulb), a sunny situation, a loam soil, and

weekly spraying with Bordeaux mixture will go far toward ensuring success with this old favorite. New and superior seedling types will soon be on the market. Over a hundred years ago an unknown person in Europe crossed it with the brilliant red Scarlet Turks-cap Lily (*Lilium chalcedonicum*) and produced the beautiful light apricot Martagon-flowered Nankeen Lily (*Lilium testaceum*). Its cultural requirements are similar to those of the Madonna Lily. It has a virus which does not harm it, but it should be kept apart from other Lilies.



Madonna Lily (*Lilium candidum*)

From *STIRPIUM HISTORIAE PEMPTEDES SEX*,
by Rembert Dodoens, 1583

Upright Flowers

The upright-flowered Lilies are represented by the Star Lily (*Lilium concolor*), a dainty, small-flowered, brilliant red Lily, growing not higher than 18 inches; the Candlestick Lily (*Lilium dauricum*), a red Lily from eastern Asia; and the Orange Lily (*Lilium bulbiferum* var. *croceum*), a bold, striking plant not seen in gardens so frequently as it should be. *Lilium umbellatum*, a hybrid group of many forms, is of easiest culture; but while the varieties are bold and colorful, they are not especially beautiful. Reds and oranges predominate. A recent arrival from China is *Lilium tsingtauense*, a brilliant orange, upright Lily, wholly distinct from the others and well worth a place in the garden.

Turks-caps

There are many Asiatic Martagons, mostly of easy culture and well deserving of a place in the garden. One of the most reliable is the Chinese *Lilium Davidii* with its variety *Willmottiae* (the latter sometimes called *Lilium Willmottiae*). Both are brilliant orange, and have many flowers and narrow grass-like leaves. Both grow to 6 feet or more; *Lilium Davidii* is stiff-stemmed, but its variety *Willmottiae* is weak and needs staking. An unusually fine type of this Lily is the Maxwell Lily; and so reliable is it that it should be on every beginner's list.

Another lusty "Chinaman" is *Lilium Henryi*, a 6- to 9-foot, orange-flowered Turks-cap; it "prefers" a stiff loam; and light shade will keep its flowers from fading in the hot sun of late July and August. It is sure to succeed if given half a chance. Usually the stem is lax and needs the support of shrubbery or a stake, but a stiff-stemmed form is known. *Lilium Henryi citrinum* is a lovely light yellow form, but is very much in need of a stake to keep its pretty flowers up where they belong. *Lilium Henryi* has been crossed with *Lilium myriophyllum*



McFarland photo

Brocade, a Backhouse hybrid, in the author's garden

to produce the Havemeyer Lily, a distinct and beautiful hybrid. *Lilium Henryi* crossed with *Lilium Sargentiae* has produced *Lilium aurelianense*, similar to Havemeyer. Seedling strains of both are interesting and worth while, and are available from commercial sources.

A small island off the coast of Korea has given us *Lilium Hansonii*, as nearly foolproof as a Lily can be. Virus, basal rot, and Botrytis trouble it not. Its flowers (of Martagon type) are yellow, and the petals are the thickest of all Lilies. It is prettier in the shade, and "likes" some peat in the soil.

Lilium amabile, orange-red, and its variety *luteum* (one of the handsomest of yellow Lilies) both do well; but the latter is prettier. They grow to 3 feet, and "like" a sunny situation. The dainty, small-flowered Coral Lily (*Lilium pumilum*, or *tenuifolium*) is brilliant red, narrow-leaved, and usually about 2 feet or less in height, although it may sometimes grow much taller. It is not long-lived; but seedlings progress rapidly, and a few should be started every two or three years for replacement.

No list of Lilies would be complete without the old Tiger Lily (*Lilium tigrinum*), whose large, orange-red flowers are a feature of New England gardens in late summer. It is of easiest culture, and will grow in any well-drained soil. It is often seen as a roadside escape in New England.

The Martagons (or Turks-caps) of Europe, *Lilium Martagon* and its variety *album*, are two dainty, small-flowered Lilies that "prefer" the shade. The variety *album* is especially dainty, and one of the prettiest of all Lilies. Mrs. R. O. Backhouse of England crossed the Martagon varieties with *Lilium Hansonii* many years ago, and produced the series of hybrids which bears her name. Brocade (orange-yellow with pink marbling) and Mrs. R. O. Backhouse (orange) are the best of the lot. Like their parents, they are "happier" in the shade.

Open Flowers

The Goldband Lily (*Lilium auratum*) is the most gorgeous of all Lilies; and all beginners want it. In the past, disease—especially mosaic—has been the principal cause of the failure of this Lily. If virus-free bulbs are obtained, or if seedlings are raised and isolated from other Lilies, its culture is not difficult. It is not "particular" as to soils, and it "likes" the sun or light shade. When well-grown, a colony of this Lily will excite the envy of any gardener who sees it. Its relative, the Showy Japanese Lily (*Lilium speciosum*), really a Turks-cap type, is also very beautiful, and comes in various pink varieties as well as pure white ones. Blooming in August, it has few competitors, and it often lasts well into September. Virus-free plants are long-lived and easy to grow. It is a must in every Lily collection.

West Coast Lilies

The Pacific coast of North America, especially northern California, is the home of a large number of Lilies, but unfortunately many of these are not "happy" in eastern gardens. The Leopard Lily (*Lilium pardalinum*) and its robust variety, the Sunset Lily (*Lilium pardalinum* var. *giganteum*), are most certain, but they need frequent division or they soon become clumps of short, flowerless stems. These are Turks-cap types. *Lilium Parryi*, a trumpet type, is a beautiful pure yellow Lily that sometimes persists in the garden for a few years. A series of hybrids of the west coast species, known as the Bellingham hybrids (from their place of origin), is somewhat better adapted. Shuksan (yellow) and Cyrus Gates (orange, and heavily spotted) have persisted longest with me; they are attractive Lilies of the Martagon type. A seedling strain of Bellingham hybrids includes a great variety of types in this group.

The native Lilies of the eastern United States are discussed by L. H. MacDaniels on page 90 of this issue.

GARDEN PICTURES

For harmony of tone and structure

THERE is a dramatic quality about the Lily, the way it sends up a stalk sparsely clothed with foliage to carry the heavy head of flowers at its apex. The colors are almost always striking; especially so is the contrast between the dark markings on the outside of the tube or cup and the much lighter tones on the inside; again, the white, light or dark yellow, or even maroon or scarlet of the filaments * is often the central note

* Stalks of the (pollen-bearing) anthers.

in the whole scheme and gives just the right accent or contrast.

Lilies do not merge into soft billowy mounds of perennials in the border, but stand out conspicuously; and wherever they are in the garden, they dominate the scene. From the cultural angle as well as the aesthetic, they do better where they are not crowded. They should have sufficient space around them so that roots of shrubs or trees or strongly growing perennials will not encroach upon them



Lilies, in bud, in a border with Bellflowers in the foreground

McFarland photo

WITH LILIES

By HELEN M. FOX

underground; and so that branches will not spread too close overhead to permit air currents to pass freely. Air currents are needed, to dry the foliage after rain or fog, because wet leaf surfaces would furnish attractive abodes for molds and insects.

Lilies are unpredictable: to date there is no one formula by which to grow them successfully. After thirty years or more of association with these beautiful and

capricious plants, it seems to me that the prospective grower had best try one situation after another until he finds one in which his plants will thrive in his garden. A slope is always good; and so is well-drained land. A low ground cover helps, and so does some protection from raw winter's winds. Lilies, with few exceptions, are not long-lived; and so it is a good plan to keep raising seedlings or offsets to keep up the supply.



Madonna Lilies along garden path

Gottsch-Schleisner photo



Author photos

(Above) Star Lily (*Lilium concolor*)

(Below) *Lilium tsingtauense*



With Pieris and Box

There are several situations in my garden where Lilies have done well and are still doing well. The first ones to be described are in the sun. One such place is in front of the terrace wall south of the house, where there is a planting of *Pieris japonica* edged with Korean Box. Amid these shrubs are thriving *Lilium Sargentiae*; the Showy Japanese Lily (*Lilium speciosum*), both pink and white; and the Regal Lily (*Lilium regale*), along with some of its hybrids.

With Herbs

Being a grower of herbs, it was natural for me to try Lilies with Lavender, Hyssop, and the decorative Sages. The Showy Japanese Lily has done very well in this situation. However, oddly, in the small rectangular herb garden, although fifty bulbs of the Regal Lily were planted in each of the four corners, they disappeared promptly from all but the one corner which faced south and was protected from the north and west by shrubbery; there they increased. Their disappearance from the other south-facing corner may have been due to the proximity of weeping Birches and the drip from the branches, or to the fact that the ground was more level there. Since a southern exposure and protection on the north seemed to suit them, also sloping ground, a similar situation was found for them where a ground cover of Thyme, Lavender, and Winter Savory was planted. Here the Regal Lily and its hybrids, as also the Candlestick Lily (*Lilium dauricum*) and its hybrids, *Lilium Davidii*, *Lilium formosanum*, the Leopard Lily (*Lilium pardalinum*), the American Turks-cap Lily (*Lilium superbum*), the Caucasian Lily (*Lilium monadelphum*), and *Lilium tsingtauense* do very well. The members of the group of *Lilium elegans* and *dauricum* and their hybrids are—to my way of thinking—coarse, and not nearly so handsome as other Lilies. Moreover, most of them are subject to mosaic.

Companions for Difficult Colors

The yellow, orange, and scarlet flowers of many Lilies are a problem in the garden, for they do stand out and clash with any pink-flowered plants such as Roses, Carnations, or Sweet Williams. Interplanting white-flowered Lilies with the yellows softens the harshness, and so does a background of green, either from shrubs past their bloom or from shrubs with flowers in harmonious colors. Blue- and white-flowered shrub-Altheas, and *Hydrangea quercifolia*, *Hydrangea arborescens*, and *Clethra* (all with creamy blossoms), are striking behind *Lilium Davidii* and *Henryi*, and flower at the same time. Similarly, *Vitex Negundo* var. *incisa*, with its lavender-gray blossoms, looks handsome behind the Showy Japanese Lily. For foreground planting or interplanting, shrubby Cinquefoils (*Potentilla*) are good, and so are St. Johnsworts (*Hypericum*), either the Gold-flower (*Hypericum Moserianum*), a bushy plant with immense yellow blossoms, or *Hypericum patulum*, a low shrub with smaller flowers, or *Hypericum calycinum*, a ground cover about 8 inches high with very large flowers. Two shrubby Cranesbills, namely, *Geranium sanguineum* var. *album* and *Geranium grandiflorum* (with purple-blue flowers), are handsome with these Lilies. The brilliant scarlet, low Lilies such as the Coral Lily (*Lilium pumilum*), the Star Lily (*Lilium concolor*), and *Lilium amabile*, as also the low Candlestick Lilies, look well interplanted with Brooms and shrubby Sun-Roses (*Helianthemum*), which have white, yellow, or cream-colored flowers.

Bellflowers (*Campanula*), with Sages (*Salvia*), early Aconites (*Aconitum*), and late Irises, furnish the blues in my garden, to contrast with reds and yellows. Only a few Delphiniums are planted with perennials, and so they practically never meet Lilies. Madonna Lilies (*Lilium candidum*) are, of course, lovely with Delphiniums, as are Regal Lilies and *Lilium formosanum*; but they are hand-



McFarland photo

Lilium amabile



Gottsch-Schleisner photo

Goldband Lily (*Lilium auratum*) in the author's garden

some, too, with other blue-flowered companions.

With Bellflowers

Over the years, the supremely suitable companions for Lilies have been found to be Bellflowers. Borders are edged with the Tussock Bellflower (*Campanula carpatica*), in the gamut of purple through blue to white; and where it is rocky, there are mats of *Campanula Elatines* var. *garganica*, also of my favorite flower in the whole garden, the Harebell (*Campanula rotundifolia*). For medium height there are *Campanula glomerata*; the Willow Bellflower (*Campanula persicifolia*), which does as well in partial shade as in the sun; and *Campanula alliariaefolia*, a creamy-flowered species, beautiful when

grown with yellow Foxgloves and orange Lilies. *Campanula latifolia* lasts only a week; but its huge, deep purple bells are so striking behind or in front of the yellow-toned Lilies, that the considerable amount of space they occupy is sacrificed to them willingly. *Campanula lactiflora* "likes" some shade; with its white to gray-blue blossoms on tall flopping stems, it is beautiful with the earliest flowers of *Lilium Henryi*.

Other Combinations

Sages, too, are handsome with Lilies. Very coarse kinds, such as *Salvia Przewalskii* and the Lilac Sage (*Salvia verticillata*), make splendid foregrounds for tall Lilies. Other Sages to interplant with Lilies are the Gentian Sage (*Salvia*

patens), Clary (*Salvia Sclarea*), the Mealycup Sage (*Salvia farinacea*), and *Salvia azurea*; also *Salvia superba*, the shrubby Sage having spires of deep blue flowers with magenta bracts. Madonna Lilies are lovely rising from a ground cover of purple Violas, or planted in the green foliage of Peonies with an edging of *Nepeta Mussinii*. There is no reason at all why some of the annuals cannot be planted in front of Lilies—but that would be another story.

In the semishade the handsomest pictures are made with *Lilium Henryi*, the Turks-cap Lily (*Lilium Martagon*), and the Goldband Lily (*Lilium auratum*). The Turks-cap, its hybrids, and *Lilium Hansonii* bloom from mid-June into July with me; they have been in the garden so long that they have formed thick clumps. They are grown on either side of a path in an avenue of Dogwood trees. With them, towards the front, are Siberian Irises, and behind them, Day-Lilies. They both have to be thinned once and sometimes twice a year. A second shade picture is made by *Lilium Davidii* and *Lilium Henryi* growing

against spring-blooming shrubbery, with a ground cover of ferns and a few Gentians.

The Goldband Lily is so outstanding that it deserves a place to itself without any other Lily, or even any other flower at all, to encroach on its magnificence. It is grown against green shrubs past their bloom, with a ground cover of *Pachistima Canbyi*.

Tiger Lilies (*Lilium tigrinum*), subject to mosaic, are put out in a semiwild place where they are handsome with coarse Bellflowers, like the Rover Bellflower (*Campanula rapunculoides*), and Day-Lilies. American Turks-cap Lilies (*Lilium superbum*) are grown with a planting of False-Spireas (*Sorbaria sorbifolia* and *arborea*), as are Meadow Lilies (*Lilium canadense*). Meadow Lilies do not "like" my garden and never stay with me, nor do Wood Lilies (*Lilium philadelphicum*).

Thus it can be seen that from the end of May, when the first flowers of *Lilium elegans* open, until deep into October, when the last plant of *Lilium formosanum* blooms, there are pictures made with Lilies.

LILIES FOR THE ROCK GARDEN

Most Lilies are too tall and have too large flowers to be suitable rock garden subjects; but in large rock gardens of massive construction a few of the smaller kinds may find a place. The Star Lily (*Lilium concolor*), *Lilium rubellum*, *Lilium cernuum*, and selected low-growing plants of the Coral Lily (*Lilium pumilum*, or *tenuifolium*) and its variety Golden Gleam are as suitable for the rock garden as any Lilies. An effective way of using Lilies in the rock garden is to combine them with *Cotoneaster horizontalis* against a large rock.

Lilium rubellum



McFarland photo

NEW GARDEN LILIES

Garden-worthy and garden-hardy

Alan Macneil

IN recent years, Lily hybrids in startling array and quantity have been created and presented to the public. Whether this is because the hybridizing that has proceeded patiently for many generations has created a base that makes the present crosses possible, or whether the recent hybrids are a result of newly developed and carefully applied skills, I would not pretend to say. The fact remains that forms, colors, and crosses that were only remote dreams yesterday are becoming available today, and the horizon for tomorrow is an enticing glitter. Crosses of the Goldband Lily (*Lilium auratum*) and the Showy Japanese Lily (*Lilium speciosum*), of the Goldband Lily and *Lilium rubellum*, of the Tiger Lily (*Lilium tigrinum*) and *Lilium umbellatum*, of *Lilium cernuum* and *Lilium Willmottiae*, of *Lilium myriophyllum* and *Lilium Henryi*, of the Madonna Lily (*Lilium candidum*) and the Nankeen Lily (*Lilium testaceum*)—these have all been made. In addition to these and many other crosses, there is an increasing tendency toward breeding and selection within the species themselves. We now have the American Turks-cap Lily (*Lilium superbum*) in deep blood red, in yellow, and in apricot; and we have trumpet Lilies in yellow, in gold, in rose, and in apricot. All of these things are from many breeders and many sources. Not all of them are available in commercial quantity as yet; and some of them may not be, within our lifetime; but the fact that they have been created at all means that, even if present stocks should perish, the path is laid and can be traveled again some future day.

With few exceptions, the new hybrids and natural selections are garden-worthy and garden-hardy plants. They not only look well, but for the most part they grow well and are much more adaptable to a greater variety of garden conditions than are some of the parents. This is due, of course, to an intelligent breeding program and careful selection. Hybridizers are increasingly coming to realize that, for all the beauty in the world, a plant that cannot be grown is a liability rather than an asset in the garden.

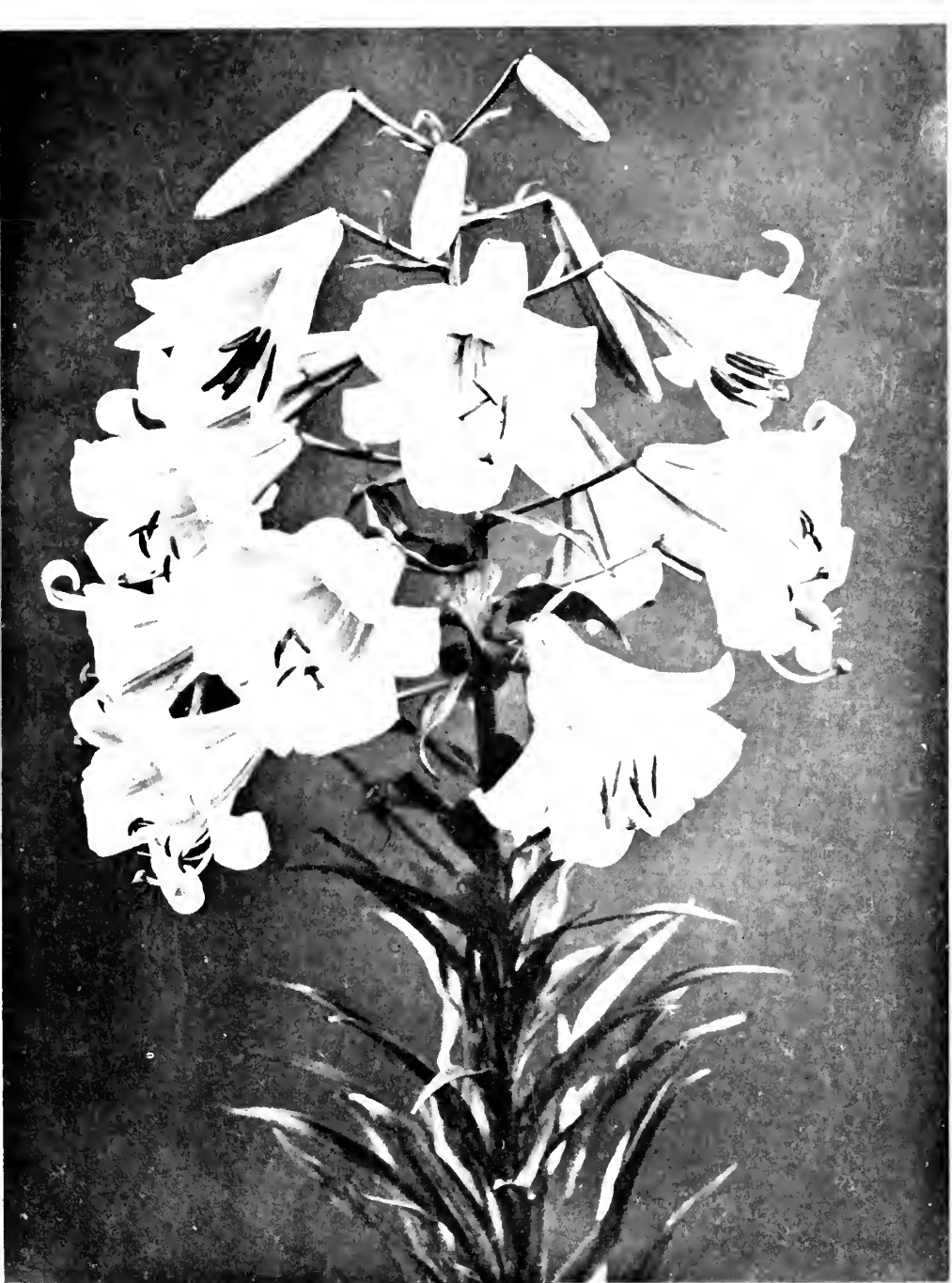
Workers

Many names have contributed and are continuing to contribute to this changing scene; in passing one can mention only a few of those now working in North America. Mrs. J. Norman Henry has largely confined her important work to discovery and selection of natural variants within a few of the species native to the eastern United States. The following are all hybridizers of real distinction: George L. Slate, Norma E. Pfeiffer, Isabella Preston, F. L. Skinner, Jan de Graaff, W. C. Horsford, L. N. Freimann, Tom Barry, Carlton Yerex, S. L. Emsweller, and E. F. Palmer.

Hybrids

A general survey of some of the newer hybrids that are at present available to gardeners includes the following as outstanding:

The Aurelian hybrids that are being developed by Carlton Yerex are excellent at present and full of promise for the future. They generally flower in mid- to late July, and are crosses of *Lilium Sargentiae* and *Lilium Henryi* recrossed with some of the trumpet hybrids. There are several trumpet-shaped Lilies in



McFarland photo

Flower cluster of a Centifolium hybrid Lily

varying shades of yellow and ivory, others with wide flaring mouths, and still others that are partially or sharply reflexed. The color range is from white, through the yellows, to apricot and burnt orange. All of them are interesting and exciting.

Freimann's pink Centifolium hybrids are not actually pink; rather they are what the color charts call Ephyrite Red, which means that they are practically identical in color with Joe-Pye Weed. They are three to four weeks later than most of the hybrids of the Regal Lily (*Lilium regale*), and are most vigorous, generally reaching 6 to 8 feet.

Galahad (E. F. Palmer) is a new trumpet Lily that is pale yellow or cream in color. It is a tall and vigorous hybrid that flowers later than most of the trumpet Lilies. In spite of the fact that it does have mosaic, it is a contribution of great merit. Unlike most hybridizers, Mr. Palmer has the attitude that, to be an effective garden plant, a Lily must be able either to resist mosaic completely, or (if infected) to grow beautifully in spite of it. I believe I am interpreting correctly. It is a fresh and courageous approach, and one with which the average gardener, who is not concerned with Lilies as a specialty, is apt to concur.*

Helen Carroll (Skinner) is a clear yellow development of the Candlestick Lily (*Lilium dauricum*). The blossoms are extremely large and well shaped, and the color beautiful—far and away the best yellow in this entire group. The plant is dwarf, and does not flower until well into July, which is late for Lilies of this group.

Seneca (Slate) has been honored with awards both in this country and in England. It is a hybrid of the Tiger Lily and *Lilium Leichtlinii* var. *Maximowiczii*;

* Many of the trumpet Lily hybrids are tolerant of mosaic, and perform satisfactorily even though infected. Lilies that are not tolerant of mosaic should be kept away from varieties that are carriers of the virus.—Ed.

it flowers in late August and early September, and is a tall and graceful plant. The color of the blossoms is a soft shade of reddish apricot, which is excellent at that time of the year when combined with the mauve of fall Asters.

T. A. Havemeyer and the Havemeyer hybrids (Barry). This group of hybrids resulted from a cross of *Lilium myriophyllum* and *Lilium Henryi*, one of the first and most important crosses of the contemporary era. The large blossoms are generally reflexed or semireflexed, and the colors range from ivory, through citron, yellow, and apricot, to burnt orange. All of these hybrids are as vigorous and easily grown as is *Lilium Henryi*; they flower in August.

The Duchess (Skinner) is an early-June-flowering Lily with rather large, flat, outward-facing flowers tilted slightly downwards. The flowers are clear pumpkin-yellow, spotted with brown. The plant establishes itself well, is of graceful habit, and grows to 30 inches. This is announced as a cross of *Lilium amabile* and a yellow form of the Candlestick Lily. This of itself is interesting, as it opens up an entire new race of hybrids; but in addition, there are several features (season, fragrance, foliage) that lead me to the opinion that there might conceivably be some blood of the Caucasian Lily (*Lilium monadelphum*) somewhere in the ancestry.

Miss Isabella Preston has introduced a number of Lily hybrids of distinct garden value. All of them are crosses and selections of *Lilium Davidii* and one or more forms of the Candlestick Lily. All of them flower in early July and are striking, easily grown plants with a great deal of vigor and an infinite variety of uses. Those that appear to be destined to play an important role in gardens for many years to come are Brenda Watts (grenadine red), Edna Kean (cherry red), and Coronation, which is probably the finest of the clear yellow hybrids.

American
Turks-cap Lily
(*Lilium superbum*)



McFarland photo

Selections

American Turks-cap Lily (*Lilium superbum*), the "Henry" series. These are the color variants of the American Turks-cap that were discovered in the wild by Mrs. J. Norman Henry. There are several beautiful yellows, several fine apricots, and one deep blood red that have already been introduced; and other colors

are in the offing. All of these plants grow well, as does the natural species; and since they were collected in the South, they generally flower much later than those we are accustomed to grow; this in itself is an asset. If Mrs. Henry had done nothing more than give us *Lilium superbum* Norman Henry, we would all have reason to be grateful to her.

WILD LILIES OF THE EASTERN UNITED STATES

Some of them good in the garden

L. H. MacDaniels

THE native Lilies of North America are a distinctive, varied, and interesting group. The majority of them have rhizomatous bulbs, and leaves in whorls (circles), as shown in the illustrations of the American Turks-cap Lily (*Lilium superbum*). The Turks-cap type of flower, with strongly reflexed flower parts, is the most frequent; but there are several kinds with upright flowers, and a number of others with flowers that are intermediate between these two types.

Compared with the west coast Lilies, the eastern kinds are few in number. They include at most about eight species, the exact number depending on the taxonomic treatment [classification] of apparently closely related kinds. Taxonomic

and cytogenetic studies * now under way should clarify these relationships, particularly if related to careful studies of distribution. Among the eastern Lilies, the Meadow Lily (*Lilium canadense*) and the American Turks-cap Lily (*Lilium superbum*) are excellent garden plants.

Personally, I consider the Meadow Lily the outstanding native Lily in the garden. The range of color, from a bright clear yellow with few spots through shades of orange to bright red, and the distinctive graceful habit of the flower cluster give this Lily an appeal all its own. It is particularly effective in light shade at the edge of woodlands, where the sun shines on the flowers from time to time.

The Meadow Lily is distributed over a wide range of territory in the East. It is the common Lily of New England and eastern Canada, where the yellow form is the type. It grows most luxuriantly in low meadows, where there is an abundant water supply, and thrives in competition with Sedges and other plants above which the blossoms are borne on graceful stems. Tests of soils from a number of places where this Lily was growing well showed an acid to nearly neutral reaction. Experience in the garden also indicates a "preference" for slightly acid soils.

In the western part of its range, the orange and red forms of this Lily predominate. In my own observation, the change from the yellow to the red form occurs near the Hudson River. In western New York this Lily grows in waste fields and often on poorly drained soils. A low-growing deep red form, occasionally found on uplands, is probably only a color variant.

In Ohio and westward the typical Meadow Lily (*Lilium canadense*) ap-

* Inheritance studies involving details of cell structure.—Ed.



Author photo

Rhizomatous bulb of American Turks-cap Lily (*Lilium superbum*)

Meadow Lily
(*Lilium canadense*)



McFarland photo

pears to be replaced by the Michigan Lily (*Lilium michiganense*). The relationship between these two Lilies is apparently not well understood. The reflexed petals with a green patch at the base indicate that the Michigan Lily is more closely related to the American Turks-cap Lily than to the Meadow Lily.

Although there is a considerable amount of confusion among amateurs between the American Turks-cap Lily (*Lilium superbum*) and the Meadow Lily, the two are quite distinct. The American Turks-cap Lily may be identified by its buds, which are triangular in cross section; and by the strongly reflexed sepals and petals, each of which has a green triangle at its base. These triangles together give the

appearance of a six-pointed star in the center of the flower. The buds of the Meadow Lily are round in section. The flower parts are reflexed relatively little, and the green star is lacking in the center of the flower. The American Turks-cap Lily blossoms three weeks to a month later than the Meadow Lily.

The American Turks-cap Lily ranges from Cape Cod southward along the coast to Georgia, and westward from New Jersey along the river valleys to the Mississippi Valley. It is the most vigorous and stately of the native Lilies, sometimes exceeding 10 feet in height, and competing successfully with the rank vegetation of the river bottoms where it thrives. Although it is usually found in moist



McFarland photo

Lilium Grayi



Author photo

American Turks-cap Lily (*Lilium superbum*)

situations, it sometimes occurs on upland soils that are acid; in such situations the plants are smaller and have fewer flowers.

In the garden both the Meadow Lily and the American Turks-cap Lily thrive in moist, slightly acid soil. The bases of the plants should be shaded by other vegetation. As stem roots are weak or lacking, planting the bulbs 6 inches deep is satisfactory. Although these species have not been found with mosaic in the wild, the plants are severely injured by this disease in the garden; and so they should not be planted near infected Lilies.

Lilium Grayi is native in the mountains of Virginia and North Carolina. This Lily resembles the Meadow Lily somewhat; but the plants and flowers are smaller, and the flowers do not open wide—the parts are not reflexed at all. As a garden plant it is not so valuable as the Meadow Lily or the American Turks-cap Lily. *Lilium Michauxii* (formerly *Lilium carolinianum*) resembles the American Turks-cap Lily; but it is a smaller plant, and the flowers are fragrant. Its range is from Virginia to Florida, and west to Louisiana. I have had little first-hand experience with either of these Lilies.

The Wood Lily (*Lilium philadel-*

phicum) has upright flowers. It is widely distributed in the northeastern and North Central States and Canada. I have found scattered plants in northern Canada along the rivers flowing north into James Bay. The plants are usually solitary or scattered, and bear (each) only a single bright red flower—at most two or three. Apparently confined to strongly acid soils, it usually does not persist in the garden under conditions where the Meadow Lily and the American Turks-cap Lily thrive. The Southern Red Lily (*Lilium Catesbaci*), southern counterpart of the Wood Lily, is relatively rare.

Bulbs of the native Lilies, particularly the American Turks-cap Lily and the Meadow Lily, are readily available from collectors or may be gathered from the wild. Some selected clones of the American Turks-cap Lily have been propagated by Mrs. J. Norman Henry, and are sparingly available in the trade. Those who collect their own bulbs should be cautioned against taking all the plants from any one locality. On the other hand (except in out-of-the-way places) cattle, the plow, and the mowing machine are far more destructive to wild Lilies than is the collector.

NOTES ON PROPAGATING LILIES

For the uninitiated grower

Neil W. Stuart

THAT Lily bulb you planted so carefully in your garden can be increased to a sizable clump or colony without the purchase of additional stock, if you have a good location and are in no particular hurry.

Bulblets and Scales

The old bulb will divide or produce off-sets. Bulblets will also form on the stem between the old bulb and the soil surface. These new bulbs may be removed in the fall and replanted at once. A few Lilies, such as the Tiger Lily (*Lilium tigrinum*) and *Lilium Sargentiae*, produce bulbils (bulblets) on the stems above ground, just above the points of attachment of the leaves. The bulblets should be col-

lected when they can be removed easily from the stem, and should be planted in late September or October. These methods of increase are called vegetative propagation, to distinguish them from sexual propagation, which is by seeds. Vegetatively propagated plants are identical with the parent. Seedlings differ from one another, the degree of difference depending upon whether or not the parent plants are hybrids.

The most rapid vegetative propagation of a Lily is accomplished by scaling the bulb. This may be done at any time; but if the scales are to be planted outside, it must be done while the weather is still warm. The plants may be dug soon after flowering, and several of the fleshy overlapping segments of the bulb (known as scales) removed. The scales should be dusted with a fungicide, Arasan or Fernate (obtained at a garden supply



(Left) Dormant bulb

(Middle) Growing bulb, showing basal and stem roots and one scale loosened

(Right) Scale producing bulblets.



Scales of Easter Lily (*Lilium longiflorum*) which have formed bulblets under sphagnum in the greenhouse

store), and replanted at once with a covering of about an inch of soil. The bulb from which the scales were removed should also be dusted with one of the fungicides, and replanted at once. Fungicides containing mercury, such as Ceresan or Semesan, must not be used, for they are very injurious to Lilies. The sulfur-containing Arasan and Fermate are effective against *Fusarium* bulb rots, and also appear to stimulate plant growth.

If the planted scales are kept moist and warm, small bulblets and roots will soon form, and a few leaves may emerge during the fall. Before freezing weather, the scales should be covered with an additional 2 or 3 inches of soil. After the ground is frozen, a mulch of straw or salt hay should be applied and weighted down so that it will not blow away. This mulch must be removed early in the spring. The bulbs are dug at the end of the summer, and planted in permanent locations.

In a greenhouse, scaling can be carried on at any time, provided the scales are kept warm and moist. A moist condition is easily maintained by placing the scales on sand and covering them with about 2



U. S. D. A. photos

Bulblets of Easter Lily (*Lilium longiflorum*) formed from scales planted outdoors a year previously

inches of wet sphagnum. Under these conditions bulblets and roots are formed within a few weeks, and the scales are ready to be shifted to pots or flats or to the garden. The inclusion of a small amount of a root-inducing chemical (such as naphthalene-acetic acid) with the fungicide used in dusting the scales has resulted in the production of more bulblets than when the scales were treated with the fungicide alone or were not treated at all. However, these increases are relatively small; and the use of the rooting hormones may be omitted, provided the scales are treated with the fungicide.

Vegetative propagation of Lilies propagates also any virus diseases present in the plants. Furthermore, there is no known cure for these diseases. Since the virus is not carried in the seed, starting with seedlings insures virus-free stock. Also, it is less costly to grow seedlings than to purchase bulbs.

Seeds

There are two classes of Lilies based on the germination behavior of the seeds.

Lilies of the first class, such as the Easter Lily (*Lilium longiflorum*), the Regal Lily (*Lilium regale*), and *Lilium amabile*, *Henryi*, and *formosanum*, have seeds that germinate and produce leaves in two to four weeks after being planted. Lilies of the second class include the Leopard Lily (*Lilium pardalinum*), the Meadow Lily (*Lilium canadense*), the American Turkscap Lily (*Lilium superbum*), and some forms of the Showy Japanese Lily (*Lilium speciosum*). Seeds of these Lilies produce tiny bulblets at temperatures of 65° to 70° F.; the bulblets must be exposed to low temperatures (35° to 50° F.) for several months before they will produce leaves. It is evident, therefore, that the best method of raising seedlings depends upon which class of Lily is concerned.

For seed from Lilies of the first class, no low temperature is necessary to start growth. Consequently, if these seeds are planted too early in the fall they may start growth and then be injured by winter freezes. It is probably safer to plant the seed of these Lilies in the early spring, as soon as the ground can be prepared. The plants need not be transplanted until after the second season's growth.

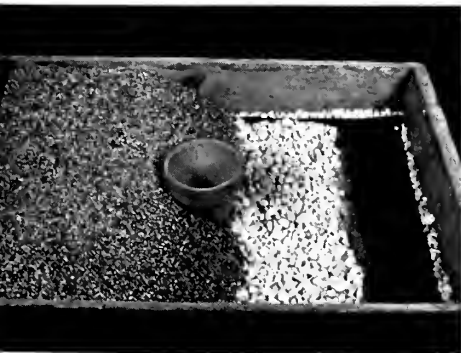
Lily seed of the second class should be planted in the spring or early summer, preferably in flats. Tiny bulbs form under the soil, and remain dormant until

the following spring. If the flats are placed in a cold frame, earlier growth may be expected in the spring.

If one has a greenhouse, certain modifications may be made in growing the seedlings. One of these modifications involves the medium in which the seeds are planted. If seeds unprotected by a fungicide are planted in unsterilized soil, many of the seedlings that are produced may damp off or the bulbs become infected with basal rot. Better results are obtained if the seeds are soaked for several hours in a water suspension of Tersan before being planted. Tersan is a wettable form of the fungicide Arasan. This treatment disinfects the seeds, and leaves them with a protective coating.

Excellent results have been obtained at the Plant Industry Station, Beltsville, Maryland, through the use of expanded vermiculite as a medium for germinating Lily seeds. Vermiculite manufactured for horticultural use is sold nationally under such trade names as Terra-Lite, Mica-Gro, etc. The grade with particles about 1/8 inch in size is most satisfactory for Lily seed flats. Best results have been obtained when the flats are sub-irrigated. For this purpose fiber-resin watertight Neponset inserts* are inexpensive and easy to use. The insert is

* Available in standard sizes from Bird & Son, East Walpole, Massachusetts.



Seed flat for Lilies, showing insert, water reservoir, gravel, and vermiculite



Seedlings of Easter Lily (*Lilium longiflorum*) growing in vermiculite

fitted into the flat, an inch of coarse gravel or vermiculite placed in the bottom, and a 2½-inch clay pot set on this for adding water (see illustration). The flat is then nearly filled with vermiculite and the seeds planted at a slightly greater depth than when soil is used. Water is added through the clay pot until the surface of the vermiculite is moist. Ordinarily the seed flat needs no further attention for several days. Since the vermiculite lacks nitrogen and phosphorus, the seedlings must be "fed" occasionally with a nutrient solution. Soluble fertilizers (such as Hyponex or Liqua-Vita) are available at garden sup-

ply houses, and are convenient for this purpose.

Limited trials have shown that a mixture of vermiculite and shredded sphagnum, or sphagnum alone, can be used for germinating Lily seeds. Seed flats containing sphagnum are top-watered, since water does not move through this material readily by capillarity.

In propagating Lilies, then, one must consider the results desired, the facilities available, and the kinds of Lilies to be used. With due regard for the methods and precautions given here, any careful enthusiast should be able to raise his own Lilies.



Courtesy of The Metropolitan Museum of Art

Ancient Cretan vase based on the form of a Lily



MMIII

KNOSSOS EPM 603

From ANCIENT EGYPT, March, 1929

A naturalistic Lily motive used to decorate huge jars in Knossos of Crete in the ancient days of 2300 B. C.



Regal Lily (*Lilium regale*)



Sunset Lily (*Lilium pardalinum* var. *giganteum*)



Coral Lily (*Lilium pumilum*)



Goldband Lily
(*Lilium auratum*)

Japanese Lily
(*Lilium japonicum*)





Hanson Lily (*Lilium Hansonii*)



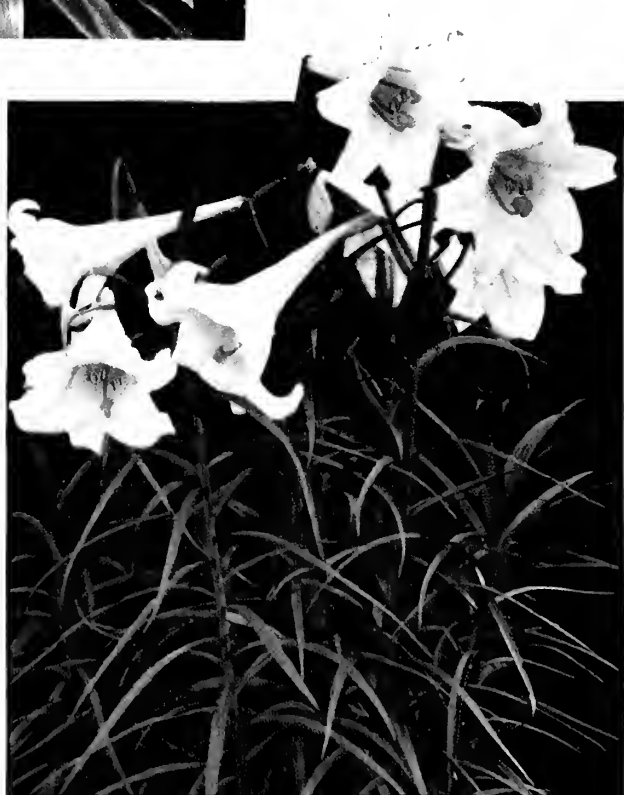
Henry Lily (*Lilium Henryi*)

Turks-cap Lily (*Lilium Martagon*)





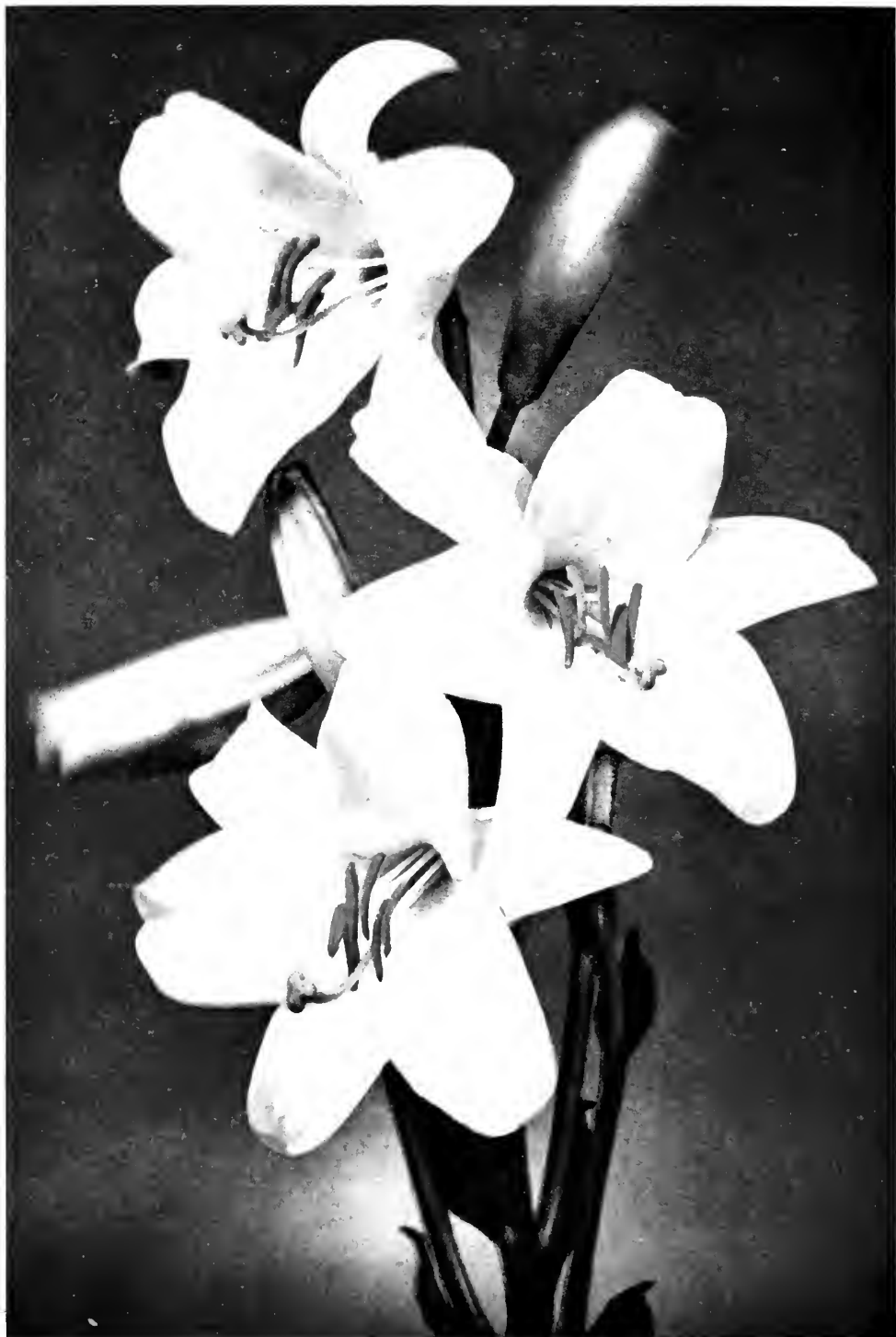
Candlestick Lily
(*Lilium dauricum*)



Formosa Lily
(*Lilium formosanum*)



Umbel Lily (Lilium umbellatum)



Madonna Lily (*Lilium candidum*)



From LUCA DELLA ROBBIA, by Allan Marquard. Published by Princeton University Press

The Wellington Adoration

or

The Madonna of the Lilies

Flowers have been associated, throughout the ages, with man's effort to interpret social and spiritual traditions. Thus flower symbolism became a part of the world's folklore, religion, and art. In the exquisite ceramic medallion shown—the work of Luca Della Robbia, an Italian artist of the fifteenth century—the Lilies are used not only to lend dignity to the design but to express the beauty of divine mother love, since the Madonna Lily had become the symbol of the Virgin in religious art.

DISEASES IN THE LILY GARDEN

Avoid them, or grow resistant varieties

Philip Brierley

LILIES, as well as most other choice garden flowers, may sometimes be ruined by disease. The serious gardener will be at pains to know the nature of the

common Lily diseases, and will be prepared to avoid or to combat them. Three diseases are common enough to claim the attention of each thoughtful Lily grower: mosaic, Fusarium bulb rot, and Botrytis blight.

Mosaic

Mosaic, best recognized by mottling of lighter and darker green in the leaves, is a virus disease that persists in all vegetative parts (leaves, stems, and bulbs) of affected Lilies, but is not carried in the true seeds. Seedling Lilies remain free from mosaic so long as they are not exposed to infection, which results from visits of aphids (plant lice) that have previously fed upon diseased Lilies. Some kinds of Lilies can carry mosaic without showing any symptoms; hence it is not always possible to detect disease sources by inspection of a mixed collection. As there is no known method of curing a Lily plant, once it has become infected, mosaic is clearly a disease to be avoided in the Lily garden. One way to avoid it is to grow all one's own Lilies from seed; but this approach is slow and rather exacting, and necessarily excludes from the collection some Lilies that fail to produce seed or that fail to come true from seed. An alternative approach is to buy bulbs from reputable dealers who specify freedom from mosaic disease.

Some Lily gardens already contain mosaic-affected Lilies: for example, a fine old clump of the Madonna Lily (*Lilium candidum*), which can carry the disease without symptoms, or perhaps an Easter Lily reclaimed from a pot. Such material in the garden will usually make it impracticable to grow the Tiger Lily (*Lilium tigrinum*), or *Lilium formosanum*, unless the aphid carriers are uncommonly scarce. It is difficult to remove such



U. S. D. A. photos

Mottling in leaves of *Lilium formosanum* caused by mosaic disease



Lilium formosanum: bulbs deeply invaded and basal roots completely destroyed, by Fusarium rot; stem roots (and tops) still normal

sources of mosaic, as the plants persist stubbornly from scales; and it is not even desirable to take them out if they are attractive flower-producing specimens. When confronted with this problem of mosaic already established in one's own garden, or even in the garden of a near neighbor, it is wiser to abandon the mosaic-free concept, and to choose Lilies that resist, escape, or tolerate mosaic. Fine Lilies that will grow under severe mosaic hazards are the Regal Lily (*Lilium regale*) and its hybrids. *Lilium Davidii* and a number of other Lilies may succeed under such hazards, but it is best to determine by trial and error which ones will thrive in each situation.

Fusarium Bulb Rot

Fusarium bulb rot is a fungus disease carried in the bulbs and in the soil. Roots and bulbs are destroyed by a soft brown decay, commonly appearing first near the basal plate of the bulb and causing the scales to fall away separately.

Those Lilies that develop strong stem roots may survive long after the basal roots and bulbs are affected. Yellowing of leaves and general dwarfing are symptoms seen above ground. A disease capable of persisting in the soil as this one does should be avoided if possible. Careful examination of newly acquired bulbs, with rejection of any that show decay, will help to avoid introducing Fusarium rot. Bulbs free from such blemishes may be dusted with full-strength Arasan, or dipped in a suspension of Tersan 1 to 64 (1 pound in 8 gallons) or Fermate 1 to 64, to destroy any of the fungus that may be lodged on the surface. Valuable bulbs that show traces of Fusarium rot may sometimes be salvaged by trimming away all decay, then treating with one of these fungicides.

Seedlings of all kinds of Lilies are subject to Fusarium decay. Special care should be taken to plant seed in soil free from this disease, or in soil that has been treated with formaldehyde or chloro-

picrin to eliminate disease-producing fungi. Seedlings may also be grown in vermiculite, an excellent medium for germinating seeds, which is free from disease agents when purchased. When seedlings are ready for transplanting from the seed box to the garden they may be rinsed in water, then dipped momentarily in the Tersan or Fermate suspension as a precaution against *Fusarium* invasion.

Clean bulbs and clean seedlings should be planted in *Fusarium*-free soil. Soils that have not previously grown Lilies may be assumed to be free from the Lily *Fusarium*. If diseased Lilies have been grown, the infected soil may be freed of the decay agent by chemical treatment,

with formaldehyde or chloropierin for example; but this is rarely practicable in mixed borders because such chemicals will damage other near-by plants. It is simpler to avoid the infected area by shifting the Lily plot to a new site. When space does not permit such a shift, a selection of the more resistant Lilies may be grown despite the presence of *Fusarium* rot. The Regal Lily and its hybrids, and *Lilium Sargentiae* are resistant, as are the Leopard Lily (*Lilium pardalinum*), the Tiger Lily, *Lilium Hansonii*, and *Lilium Leichtlinii* var. *Maximowiczii*. Others may succeed where the *Fusarium* disease is not too firmly established. Those most vulnerable to this disease are the Madonna Lily, the Nankeen Lily (*Lilium testaceum*), and *Lilium formosanum*.

Botrytis Blight

Botrytis blight is a fungus disease of leaves, stems, and flowers, producing unsightly brown spots that may enlarge and run together as a general blight. Such prominent spotting of aboveground parts always causes alarm, but Botrytis blight rarely kills Lilies outright, as does the more insidious *Fusarium* rot. Of course the severely blighted plant is greatly weakened, as well as worthless for ornament. In wet weather the blighted areas become covered with a gray mold which bears spores that can initiate a new series of blighting spots. This cycle can be repeated many times during one rainy growing season. Eventually the blighted parts fall to the ground, and lie on the surface or become incorporated in the surface soil. A fresh crop of blight spores is produced on this debris in time to blight the new growth put forth by the Lilies in the following spring. The Madonna Lily is one of the most susceptible to Botrytis blight, and is also unique in providing a special means of overwintering the blight fungus. This species alone develops a fall rosette of leaves that are cold-resistant and often live through the winter. Botrytis commonly attacks this



E. P. McWhorter photo

Spots on leaves of Easter Lily (*Lilium longiflorum*), symptoms of Botrytis blight

*Lilium
Davidii*



Russell Pansie photos

fall rosette, and lives in it through the winter; there it is in a favorable spot when it resumes activity in the spring.

Botrytis blight can be avoided to some extent by planting Lilies in spots that permit rapid drying of the leaves after rain or dew. Generous spacing, rather than crowding the plants, will help; also gathering and burning the old stalks and leaves in the fall; and inspecting the rosette leaves of the Madonna Lily in the fall and spring, and removing the spotted ones. If the site, the locality, or the season is a dry one, these general sanitary precautions may suffice to keep the blight in check. In humid areas, and in rainy seasons elsewhere, spraying may be needed to control blight. The most susceptible Lilies, particularly the Madonna Lily and the Nankeen Lily, may need the protection of a spray when others withstand the blight without this. Freshly prepared homemade Bordeaux mixture at 4-5 strength, with a suitable wetting agent (such as Penetrol 1 to 400), is the only fungicidal spray material known to be effective against Botrytis blight under conditions that favor development of the disease.

Thus, in some cases, in spite of all precautions, it is necessary to wage a definite fight against disease.



Lilium Sargentiae

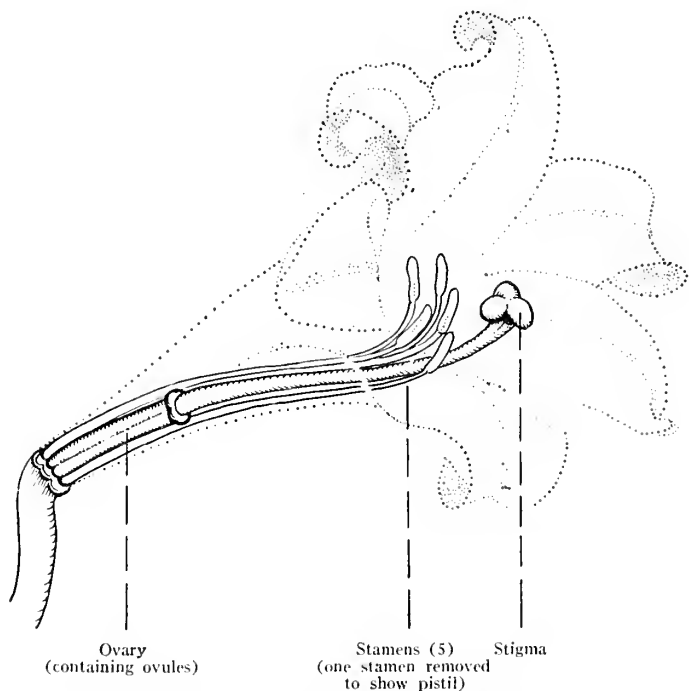
HOW TO BREED NEW LILIES

A hopeful project for the amateur

S. L. Emsweller

THE breeding of Lilies is an almost untouched field, where the rewards are practically certain to give great compensation for any efforts put forth by the amateur or professional breeder. This great group of plants is a comparatively recent acquisition in our gardens; and unfortunately, most gardeners are almost totally unfamiliar with the wealth of Lily material available to them. It is also commonly believed that Lilies are all difficult to grow from seed, and that it requires from two to five years to obtain seedling bulbs large enough to produce

flowers. While there are a few species that do conform to this generally accepted idea, most Lilies are easily grown from seed, and many produce flowers within eighteen months of seed sowing. Among those Lilies that soon produce flowering-size seedling bulbs, we find the following: Coral Lily (*Lilium pumilum*), Easter Lily (*Lilium longiflorum*), Madonna Lily (*Lilium candidum*), Regal Lily (*Lilium regale*), and *Lilium amabile*, *callosum*, *cernuum*, *Davidii*, *elegans*, *formosanum*, *Leichtlinii* var. *Maximowiczii*, *myriophyllum*, *neilgherrense*, *Sargentiae*, and *umbellatum*. It is this group that holds the greatest potentialities for the amateur breeder, and will give him the quickest results.



Parts of a Lily flower involved in the breeding process

Selection from Open Pollinations

Probably all Lilies are hybrids to some extent; and in any group of seedlings the breeder will find many different forms that he can select and increase by vegetative propagation. This method of breeding has given rise to many fine new varieties of other flowering plants, and may be used to good advantage with Lilies. When this procedure is followed, the breeder merely harvests the seed pods on his Lilies, and is concerned only with the seed parent. He naturally selects pods from the finest plants only, discarding all those from inferior individuals. This sort of seed, commonly termed open-pollinated, is the result of pollination from an unknown source, either from the same plant or another growing near by.

Controlled Pollinations

Another method of obtaining Lily seed is to control all steps in the pollination process, so that both the seed parent and the pollen parent are known. Lily flowers are all rather large, and the techniques of making cross- and self-pollinations are very simple. The pollen-producing organs (called *anthers*) are borne on long stalks that surround the *pistil*; they are easily recognized because (when ripe) they are covered with pollen, some of which may fall on the inner surfaces of the petals. A *stamen* consists of an anther and its stalk. The *ovary* (lower part of pistil) contains *ovules* which later become the seeds. The *style* is the part of the pistil that (in most Lilies) projects beyond the anthers and is terminated by an enlarged club-like organ called the *stigma*. For the seed to develop, pollen must be applied to the stigma when the latter organ is "receptive," that is, covered with the sticky secretion in which the pollen grains can germinate; and the pollen tubes must grow through the style, reach the ovules, and fertilize them. If the pollen used was obtained from the same plant, the

flower is said to be self-pollinated; if obtained from another species or variety, the process is called cross-pollination.

Many Lilies will not set seed when they are self-pollinated. This is true of most forms of Madonna Lily, Easter Lily, and *Lilium myriophyllum*. Lilies of this type are said to be self-incompatible. In order to obtain seed from such Lilies, it is necessary to have several different clones* growing together, and to use pollen of one on the stigma of another. An example of this is the variety of Easter Lily known as Creole. When pollen from a Creole Lily is used on itself or on another Creole Lily, no seed is formed. If, however, the same Creole Lily is pollinated with pollen from the Easter Lily variety Estate (a different clone), many seeds are obtained.

* A clone is a group of plants all of which have been derived from a single individual by vegetative propagation (see page 93).—Ed.



U. S. D. A. photo

Lily flower showing stigma, part of style, and tips of anthers

Unfortunately it is very difficult to obtain seed from many cross-pollinations between Lily species. In some instances such pollinations do produce large seed pods, but the seedlings all very closely resemble the seed parent. These are called false hybrids, and are very common with such Lilies as the Regal Lily, *Lilium Davidii*, and *Lilium Leichtlinii* var. *Maximowiczii*. By some method, as yet little understood, the pollen of one species is capable of stimulating another to form seed without entering into the process itself. When a true cross-pollination between species is obtained, the pollen parent and the seed parent each contribute equally to the hybrid seedling, and characteristics of each may be seen in it.

Technique

When controlled pollinations of Lilies are to be made, it is necessary to remove the stamens from the flowers before any pollen has been shed. As a rule Lily anthers do not shed pollen until the flower is just starting to open. It is advisable to select buds that will open the next day,

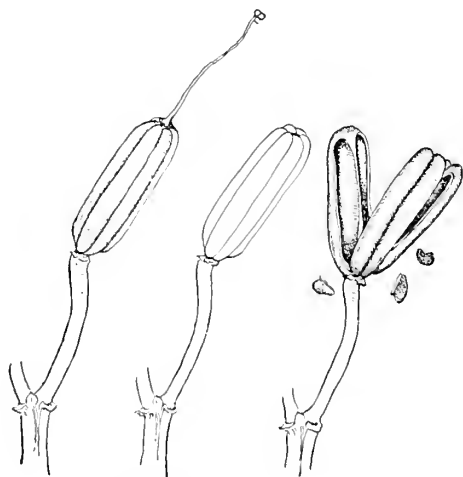
and carefully remove the stamens with forceps. Since insects carry Lily pollen from plant to plant, it is also necessary to protect the stigma from contamination by these unwanted pollens. This may be done by using large soda straws (cut into 2- to 3-inch lengths) placed over the stigma and closed by bending over about $\frac{1}{2}$ inch from the open end. If these are not available, a good substitute may be made by forming paper cylinders about round sticks of the desired diameter and fastening the edges with a good grade of glue.

Pollen should not be applied until the stigma exudes its fluid and has a shiny, sticky appearance. This usually occurs from one to two days after the stamens have been removed.

If a late-flowering Lily is to be cross-pollinated by an early-flowering one, it is necessary to store pollen of the early variety until the later one is in bloom. This may be done by thoroughly drying the pollen, placing it in a small glass vial and stoppering it with a cotton plug. This is then stored in a refrigerator as far from the freezing unit as possible. Pollen stored in this way will live for three to four months.

It is advisable to keep records of all pollinations. This is done by writing the information on a label and fastening the label on the stalk of the flower that is being pollinated. In writing these labels, the seed parent is always placed first. Thus, "*Davidii* \times *elegans*" means that *Lilium Davidii* is the female or pistillate (seed) parent, and *Lilium elegans* the male or staminate (pollen) parent.

When Lily seed is ripe, the seed pod starts to split open at the top. As soon as this happens the pod should be harvested, placed in a paper bag, and allowed to dry. Within a week or so it is ready for cleaning and examination to determine whether any seeds have been obtained. From here on the breeder lives in hope that one of his seeds will produce a new Lily worthy of a place in all gardens.



(Left) Ripening seed pod, with style still attached

(Middle) Nearly ripe seed pod, from which style has fallen

(Right) Fully ripened pod, shedding seeds

LILY CROSSES

Success plus new varieties

George L. Slate

THE beginner in Lily breeding should have a well-planned program; otherwise much time and effort will be wasted. Not all Lily crosses that produce seeds are advantageous, for many crosses give rise to seedlings most of which are like the seed parent—although sometimes if large numbers are raised, an occasional true hybrid will be produced; these crosses should be avoided. The following crosses are known to succeed, and their possibilities are far from being exhausted. If the seedlings resulting from these crosses are crossed among themselves, the breeder will have a wealth of material with which to work.



Russell Pansie photo

Showy Japanese Lily (*Lilium speciosum*)

Chinese White Lily (*Lilium leucanthum*) × Regal Lily (*Lilium regale*)
Lilium Henryi × *myriophyllum* and *Sargentiae* and Regal Lily
Lilium myriophyllum (*sulphureum*) × Regal Lily
 Nankeen Lily (*Lilium testaceum*) × Madonna Lily (*Lilium candidum* var. *salonikae*)
 Nankeen Lily × Scarlet Turks-cap Lily (*Lilium chalcedonicum*)
Lilium Sargentiae × Regal Lily
 Tiger Lily (*Lilium tigrinum*) × *Lilium Leichtlinii* var. *Maximowiczii*
 Tiger Lily × Orange Lily (*Lilium bulbiferum* var. *croceum*)
Lilium Willmottiae (*Lilium Davidii* var. *Willmottiae*) × Orange Lily
Lilium Willmottiae × *Lilium umbellatum* varieties
 Brenda Watts × *Lilium umbellatum* varieties and Coronation
 T. A. Havemeyer × *Lilium Henryi* and *myriophyllum*
 Easter Lily (*Lilium longiflorum*) clones with each other
 Goldband Lily (*Lilium auratum*) × Showy Japanese Lily (*Lilium speciosum*)
 Showy Japanese Lily × Goldband Lily (the reciprocal of the last); in other words:
 Goldband Lily with Showy Japanese Lily—either one the seed parent
 Sunset Lily (*Lilium pardalinum* var. *giganteum*) with *Parryi* and *Humboldtii*
 Backhouse hybrids with each other, and with *Lilium Hansonii* and Marhan
 Backhouse hybrids with the White Turks-cap Lily (*Lilium Martagon* var. *album*)
 Bellingham hybrids with each other
 Havemeyer seedlings with each other

For details and methods of crossing Lilies, see page 102.

What the Chart Shows

Best growers—
double-starred **

Good growers—
single starred* (good growers in most gardens, though they may need replacement from time to time)

"Best growers" and "good growers" are only suggestive terms. One or two of the new Lilies are not well enough known to be accurately classified. Also, garden and climate conditions vary so that Lilies "happy" in one garden may fail to become established in the next; and Lilies difficult in one garden may grow like weeds in another.

The flowering periods given are for central Vermont. They will have to be adjusted for gardens in other parts of the country.

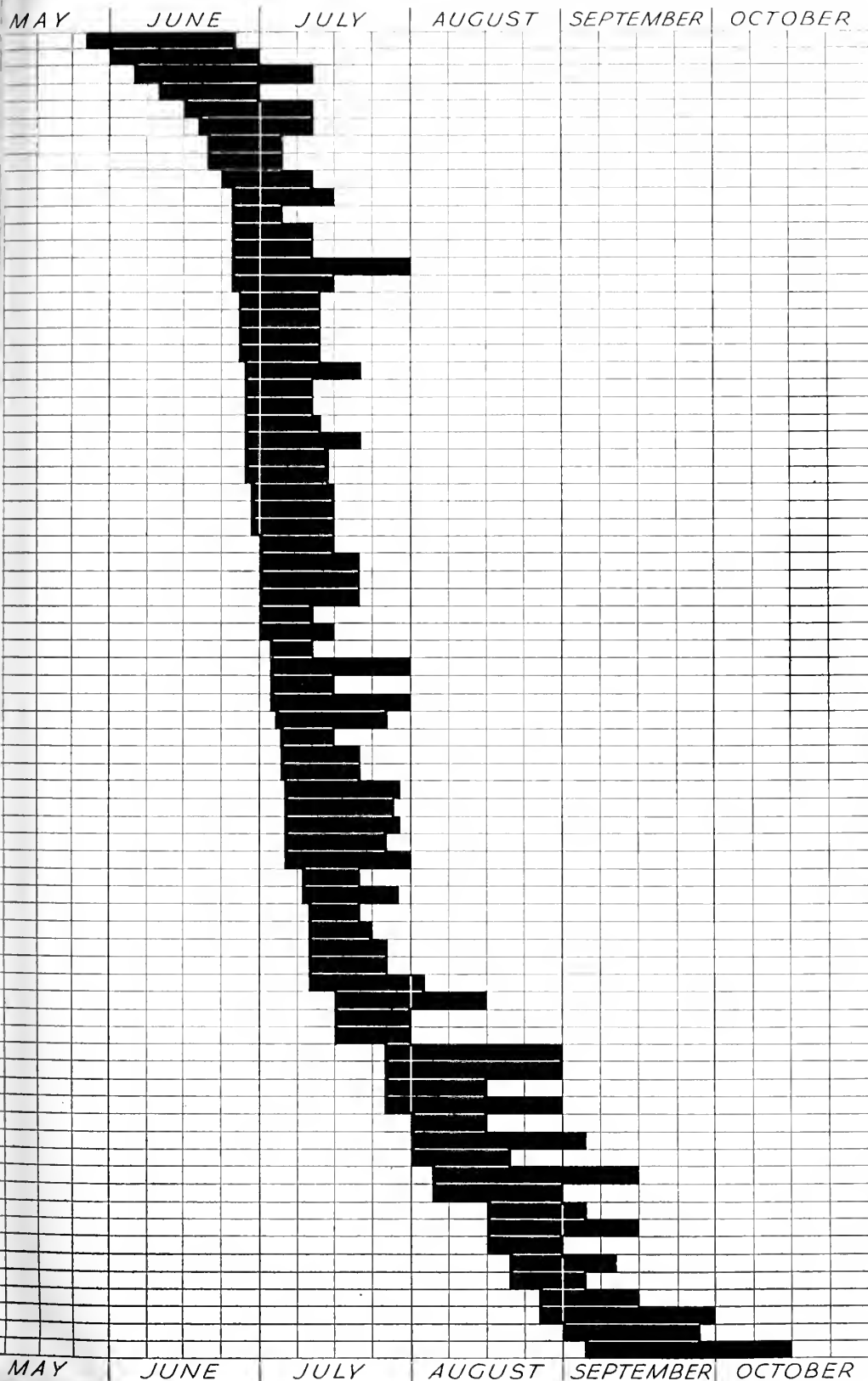
Colors of Lilies are shown by symbols given below. These letters are placed at right of name.

A—Apricot
B—Brown
I—Ivory to Pale Yellow
L—Lilac
O—Orange-red
OY—Orange-yellow
P—Pink
R—Red
W—White
Y—Yellow

From *Garden Lilies*, by Alan and Esther Macneil. Copyright, 1947, by Oxford University Press, Inc.

RUBELLUM	P★
MONADELPHUM	Y
PUMILUM (TENUIFOLIUM)	R★
PYRENAICUM	Y
PUMILUM (TENUIFOLIUM) GOLDEN GLEAM	O★
MARTAGON ALBUM	W★
UMBELLATUM W.N. CRAIG	OY★★
DAURICUM	O★★
SCOTTIAE	O★★
CONCOLOR	R★★
HANSONII	Y★★
DALHANSONII	B★
MRS. R.O. BACKHOUSE	I★★
CERNUUM	L★
JAPONICUM	P
WASHINGTONIANUM	L
PARRYI	Y
BROCADE	I★
SCEPTRE	L★★
CANADENSE	OorY★★
UMBELLATUM GRANDIFLORUM	O★★
ELEGANS LEONARD JOERG	OY★★
BROWNII	W★
FIRE KING	R★★
GUINEA GOLD	Y★★
MARHAN ELLEN WILLMOTT	B★
AMABILE	O★★
AMABILE LUTEUM	Y★★
CANDIDUM	W★
SCOTTIAE HYBRIDS	OYorR★★
BRENDA WATTS	R★★
EDNA KEAN	R★
TSINGTAUENSE	O★
UMBELLATUM MAHOGANY	B★★
PUMILUM (TENUIFOLIUM) RED STAR	R★
ELEGANS ASTROSANGUINEUM	R★★
DAVIDI WILLMOTTIAE	O★
TESTACEUM	A
DAVIDI	O★★
REGALE	W★★
ELEGANS DOUBLE SCARLET	R★★
DUCHARTREI	W
GRAYI	R★
GREEN MT. HYBRIDS	W★★
PRINCEPS	W★★
CROW'S HYBRID	W★★
PARDALINUM GIGANTEUM	R★★
SUPERBUM	O★
UMBELLATUM MOONLIGHT	Y★★
LEUCANTHUM CENTIFOLIUM	W★
MICHIGANENSE	O★
PHILADELPHICUM	R
SPITFIRE	O★
CORONATION	Y★
SHUKSAN	Y★
AURELIANENSE SEEDLINGS	I★★
MAXWILL	Oor★★
DAURICUM WILSONII	A★★
AURATUM	W★
CALLOSUM	O★★
SARGENTIAE	W
TIGRINUM	O★★
DAURICUM PARDINUM	A★★
SPECIOSUM PUNCTATUM	P★★
FORMOSANUM EARLY	W★
HENRYI	OY★★
T.A. HAVEMEYER	I★★
MYRIOPHYLLUM (SULPHUREUM)	W
SPECIOSUM RUBRUM	P★★
LONGIFLORUM, ESTATE LILY	W
WARDII	P
FORMOSANUM INTERMEDIATE	W★
SENECA	A★
BROWNII KIUKIANG	W★
SPECIOSUM ALBUM NOVUM	W★
FORMOSANUM LATE	W★

DATES OF LILIES



PETER HANSON OF BROOKLYN

For whom a Lily was named

William E. Jordan

LILIUM *Hansonii* (see illustration in color) is native to a small island off the coast of Korea, but it was named for a resident of Brooklyn: Peter Hanson, an amateur grower of Lilies, who lived at 220 Sixteenth Street, Brooklyn, New York, in the 1870's and 1880's.

Hanson and the Lily

Henry John Elwes, in his "Monograph of the genus *Lilium*," states that Mr. Max Leichtlin of Carlsruhe, Baden, "named it after Mr. Hanson of New York, who has one of the finest collections of Lilies in the world." This he did as a compliment to a friend who had sent him all of our American species. Hanson was the first person to grow this Lily in America. Max Leichtlin himself wrote in "Garden and Forest" for March 11, 1891: "For the sake of accuracy I beg to state that this Lily first flowered at Leiden with a Dutch amateur; I obtained by the agency of Mr. Mater, then manager at Siebold's, a bulb for \$20. This was in 1862. The following year I had a few more bulbs at \$25 and \$32, which I then carefully cut to pieces, leaving at each scale a bit of the trunk or body of the bulb, and I thus obtained by sowing these scales about 150 bulbs within two years. They ranged in size from that of a pea to that of a walnut. As soon as my first bulb divided I sent a bulb to Mr. Hanson, who then flowered it first in America."

Hanson, the Man

Very little has been recorded about Mr. Hanson. Were it not for the discovery of his body "by his horrified wife," the

little which is here presented would probably not have been recorded. It seems that Mr. Hanson had not come home at his usual time. Upon going to his studio in New York, his wife discovered him dead of a heart attack. The newspapers of the day carried the story, which included the sparse biographical information concerning him that we have so far unearthed. What follows is from "The New York Times" of February 23, 1887.

"Peter Hanson was a Dane, 63 years old. He came to America thirty-six years ago, and was married one year later. He began painting frescoes, and then developed a talent for landscape and marine work in oil. In a modest way he was successful, and sold many of his pictures for sums as high as \$500. He received, a few days ago, an order from a downtown businessman for a painting on silk of Vanderbilt's new yacht, the *Alva*, and had just finished a sketch of the harbor of Montreal, for which he was paid \$500. Besides this class of work, he painted rapidly for picture dealers a number of simpler examples in oil. From this work a small fortune was gathered. He bought, twenty-six years ago, land in Brooklyn, which increased in value, and he was worth, all told, perhaps \$75,000. He had a mania for the cultivation of Tulips, and was known to horticulturists in many places for having produced some new varieties. He served in the war, was an Odd Fellow, and had taken the thirty-third degree in Masonry. His neighbors liked him and his circle of friends was large." During the Civil War he was a captain in the 28th Brooklyn Regiment.

In another article he is described as "one of the most enthusiastic amateur florists . . . paying especial attention to collecting and cultivating our native plants."

Changes

Today the site of Mr. Hanson's residence is occupied by many ramshackle one-car garages, roadways, and a dwelling house, the first floor of which has been so altered that automobiles can enter into the yard beyond. Of the first floor of the house, only the stairway to the floor above is left. A sign proclaims that garages are for rent. There is nothing left to suggest that here an enthusiastic amateur once grew one of the finest collections of Lilies in the world.

A visit to his last resting place in Green-Wood Cemetery in Brooklyn, not over a mile from his once flourishing garden, revealed an unmarked, untended grave.

Should any reader of *Plants and Gardens* come across further information concerning Peter Hanson and his garden, we should like very much to know of it, so that we can augment our biography file at the Brooklyn Botanic Garden Library.



BOOKS ON LILIES

- Lilies for garden and greenhouse**, by D. T. Macfie. Published by W. H. and L. Collingridge, Ltd., London, 1947. 151 pages.
- Garden Lilies**, by Alan and Esther Macneil. Published by Oxford University Press, New York, 1946. 226 pages.
- Lilies for every garden**, by Isabella Preston. Published by Orange Judd Publishing Co., New York, 1947. 160 pages.
- Lilies for American gardens**, by George L. Slate. Published by Charles Scribner's Sons, New York and London, 1939. 258 pages.
- Lilies for the beginner**, by George M. Taylor. Published by John Gifford, Ltd., London, 1947. 79 pages.
- Success with Lilies in the home garden**, by Romaine B. Ware. Published by the author, Canby, Oregon, 1948. 36 pages.
- Lilies: their culture and management**, by H. Drysdale Woodcock and J. Coutts. Published by Country Life, Ltd., London, and Charles Scribner's Sons, New York, 1935. 242 pages.
- American Horticultural Society Lily Yearbooks**, 1939, 1940, 1942, 1946. Washington, D. C.
- North American Lily Society Yearbook**, No. 1, 1947-48. Geneva, New York, 1948.
- Royal Horticultural Society Lily Year-books**, No. 1, 1932, to No. 12, 1948. London.

WHAT IS A LILY?

How to recognize the real thing

George H. M. Lawrence

With drawings by Marion E. Ruff

UNLIKE many groups of plants, the Lily has been well identified through the centuries. To be sure, plants have been called Lilies that were not of the clan, but usually with qualifying connecting names to indicate likeness to Lilies and to distinguish them from true Lilies. The question "What is a Lily?" is rhetorical. Aside from a few exceptions to be cited later, there is little doubt as to the generic position of the seventy or more kinds of true Lilies.

The Genus *Lilium*

As a group the Lilies are readily identifiable. They belong to the genus *Lilium*. The problems of identity are presented by those members that fringe the group; and

even today the best botanical authorities are not in accord in all cases as to which members of the fringe are Lilies and which belong to other genera. The outer limits of this fringe once extended much farther from the hub than they do now. In the sixteenth, seventeenth, and even early eighteenth centuries they extended so far as to include in *Lilium* some species later segregated as *Hemerocallis* (Day-Lily), *Fritillaria* (Fritillary), *Crinum*, *Narcissus*, *Gloriosa* (Glory-Lily), *Convallaria* (Lily-of-the-valley), and *Asphodeline* (Jacobs-rod). Joseph Tournefort (1656-1708), a French botanist who is generally conceded to be the father of the modern genus concept, was the first to restrict *Lilium* as a genus to its present limits. He described it in 1694, and excluded from it many plants belonging to the genera just mentioned, and recognized *Narcissus* as a genus by that name. However, it was not until 1737 that much of



Typical Lily bulb—
bulb of Turks-cap Lily



Mariposa-Lily, with bulb having
wrapping or tunic

our present-day concept of *Lilium* was crystallized; at the same time the genera *Gloriosa*, *Fritillaria*, *Heimerocallis*, *Convallaria*, and *Crinum* were established and given their names. This was done by Linnaeus in his famous work, "Genera Plantarum," a book in which he named and described all of the genera of plants known to him, and arranged them according to his epoch-making sexual system. Sixteen years later he published his even better-known work, "Species Plantarum," and in it treated *Lilium* as a genus of seven species. All of these continue to be retained as species of *Lilium*, except one (*Lilium camschatcense*, a species whose generic affiliation is still unsettled—at present called *Fritillaria camschatcensis*); and it should be emphasized that the additional seventy-odd species known today had not been discovered and described by botanists as of 1753.

The question to be answered is: "What are the characteristics of a Lily?"—What does a Lily have that other genera do not have? By what means can one distinguish the flower of a Lily from that of any other plant?

Bulb

All true Lilies have their lowermost leaves much modified into fleshy scales that are numerous and are aggregated into a subterranean bulb. A bulb is a modified bud (short stem with leaves) that remains underground. Unlike such genera as *Allium* (the Onion) and *Calochortus* (the Mariposa-Lily), (as is shown in the drawings) the Lily bulb has no enveloping tunic (thin brown wrapping). Since about seventy-five other genera of cultivated plants also possess bulbs, that feature in itself is of limited distinguishing value.

Arrangement of Flowers and Leaves

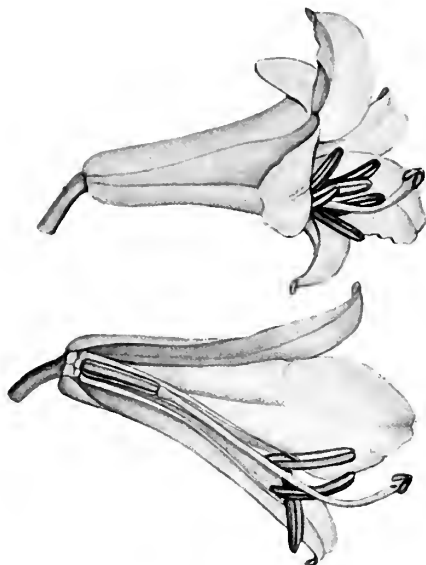
The flowers of Lilies are borne in a cluster called a *raceme*, as shown in the drawing of the Turks-cap Lily. In a few species the main stalk of the raceme is so shortened that the flowers appear to be in an *umbel*, as indicated in the drawing of the Orange Lily. In both cases the stems are leafy; the leaves are arranged either *spirally* (Orange Lily) or *in whorls* (circles—Turks-cap Lily). Of the seventy-odd genera referred to above, only about ten (including *Lilium*) have,



Turks-cap Lily, with flowers in a typical *raceme*, and leaves in *circles*

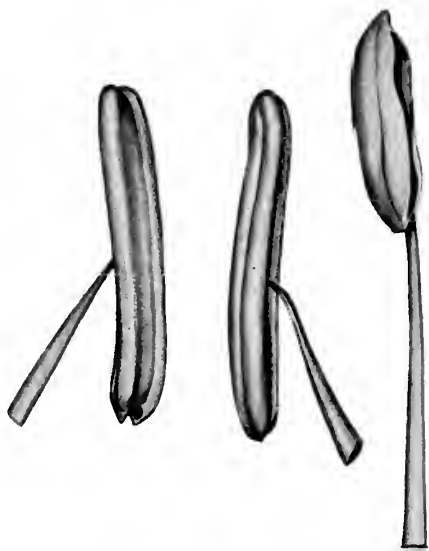


Orange Lily, flowers in an *umbel*-like *raceme*, leaves arranged *spirally*



Flower of Regal Lily

(Below) Three of the petal-like segments and three of the stamens removed



(Left) Lily stamens—attachment of stalk to back of anther

(Right) Stamen of *Fritillaria*—attachment of stalk to base of anther

in addition to a bulb, a leafy stem and the flowers in racemes.

Details of the Flower

The Lily flower has six showy petal-like segments, the three outer sometimes referred to as *sepals* and the three inner as *petals*, shown in the drawings of the Regal Lily. Within these are six *stamens* situated about a central *pistil*. The pistil has a three-lobed *stigma* at the tip (drawings). Each stamen consists of a slender stalk (or *filament*) and an *anther* at the tip, where the pollen is produced. The stalk is attached to the back of the anther; and when the anther sheds its pollen, it is usually more or less at right angles to the stalk, as shown in the drawing. In many flowers which are Lily-like, but are not true Lilies, such as *Fritillaria*, *Erythronium* (the Trout-Lily), *Calochortus* (the Mariposa-Lily), and *Tulipa* (the Tulip), the stalk is attached at the base of the anther. (Drawing of *Fritillaria*.) This feature of the place of anther attachment separates the

Lily and its closest allies from other related genera. Nectar-producing glands are common to most flowers of the Lily Family. In *Lilium* they are situated in a groove along the basal part of the inner side of the petals and sepals (as shown in the drawing), whereas in closely allied genera they are in a basal, usually circular, pit. (Drawing.)

Four Closely Related Genera

If the genus *Lilium* is as readily distinguished as the above would indicate, one may understandably inquire with what it is confused or what genera remain, that are closely akin to it. There are four names which, from time to time, have been used for plants that conventionally have been treated as belonging in either *Lilium* or *Fritillaria*. They are *Notholirion*, *Nomocharis*, *Cardiocrinum*, and *Korolkowia*. These names were given to genera described from sixty to a hundred years ago as being distinct from *Lilium*. Subsequently, and until recent time, most botanists have not

accepted them as distinct from *Lilium*. None of the four was recognized in Bailey's *Cyclopedia of Horticulture* (1917) nor in *Hortus* (1930). The genera *Nomocharis* and *Notholirion* were accepted in *Hortus* Second (1941); and it is probable that in addition to them, the genera *Korolkowia* and *Cardiocrinum* will be accepted as distinct from *Lilium* in *Hortus* Third (now in preparation). What are these genera like, and why the uncertainty of their status?

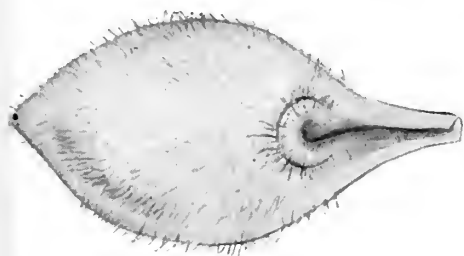
Korolkowia

The genus *Korolkowia*, if it be accepted as such, comprises a group of species intermediate in character between *Lilium* and *Fritillaria*. They have a bulb that apparently is solid (as shown in the drawing), that is, it is composed of a large single scale; whereas the bulb in *Lilium* is of many scales, and in *Fritillaria*, of a very few depressed scales. The anthers are attached at the back, as in *Lilium* (not at the base, as in *Fritillaria*);

and the nectary is a very narrow furrow at the base of the petal or sepal. To *Korolkowia* belongs the species better known horticulturally as *Fritillaria Seewerzowii*. *Korolkowia* was established as a genus by the highly esteemed Russian botanist Eduard von Regel, in 1873. It was not accepted by most botanists as distinct from *Fritillaria*; and the name *Korolkowia* did not appear in horticultural literature until it was taken up as a genus by W. B. Turrill in the 1948 Royal Horticultural Society Lily Year-book. Recently more attention has been given the Asiatic members of *Fritillaria*; and the genus *Korolkowia* has been accepted in some of the botanical and horticultural literature as distinct from *Lilium* and from *Fritillaria*. (For drawing of *Fritillaria*, see page 116.)

Nomocharis

The genus *Nomocharis* includes about a dozen species, all from western China (drawing). It was established and given



(Above) Nectar gland in a circular pit

(Right) *Korolkowia Seewerzowii*
(*Fritillaria Seewerzowii*)
(adapted from *Gartenflora*)

(Below) Nectar gland in a groove





Nomocharis saluensis: with details of flower
—short anthers, spreading sepals and petals

Notholirion hyacinthina: with flower,
branched stigma, and bulb with thin brown
tunic or wrapping



its generic name in 1889 by Franchet, who transferred to it (from *Lilium*) the two species then known. As more species were discovered and added, most of the characteristics originally alleged to distinguish the genus from *Lilium* lost their validity: in some cases exceptions became the rule; in other cases the supposed distinguishing characteristics were found also in more recently discovered species that otherwise were assignable to *Lilium*. At the present time, *Nomocharis*, if accepted as a distinct genus, is perhaps better separated from *Lilium* by its shorter anthers and more divergently spreading petals and sepals than by any other means (drawings). In many kinds the sepals are conspicuously narrower than the petals and have more slender tapering tips (drawings).

Notholirion

Notholirion was segregated from *Lilium* and recognized as a genus by Nathaniel Wallich in 1845, to account for an Indian species quite different from species of *Lilium*. It is considered now to consist of four central Asiatic species: *Notholirion campanulatum*, *hyacinthinum*, *macrophyllum*, and *Thomsonianum*. These are different from *Lilium* in that the bulb scales are enveloped by a thin brown tunic or wrapping, the basal leaves are very much longer than those borne on the stem, and the stigma is deeply branched (see drawings); also the petals and sepals have no nectary or basal pit. Unlike those of true Lilies, the bulbs of *Notholirion* die after once flowering.

Cardiocrinum

Cardiocrinum embraces those species that have been better known as *Lilium giganteum*, *cordifolium*, and *cathayanum*. More than a century ago plants of this affinity were considered by Lindley to represent a genus distinct from *Lilium*. It was he who named the genus *Cardiocrinum*. For many decades the plants were not well known; and botanists, while conceding them to be a markedly different

group from most Lilies, rejected Lindley's views and treated the plants as a sub-genus within *Lilium*. The genus was revived in 1931 by Professor Makino of Japan. More recently it has been re-studied by W. T. Stearn, who informs me that he likewise has concluded that its species are generically distinct from *Lilium*. As a group they are distinguished from true Lilies by the bulb, which dies after once flowering, and is composed of broad, much-thickened petiole bases (not of modified scale-like leaves as in *Lilium*); by the leaves, which are conspicuously netted-veined, and broadly heart-shaped in form, and have long stalks; and by the flowers, which are slightly pouched at the base, and have a dome-like stigma (drawings).

Lilium Again

The removal from *Lilium* of the four genera mentioned above, leaves a residue of about seventy species that comprises the more modern concept of the genus *Lilium*. The answer to the seemingly simple and disarming question, "What is a Lily?" is not one of simplicity. This is not the place to enter into a philosophical discussion of what a genus is. It is sufficient to say that a genus is exemplified by a description or enumeration of its characteristics, or by a listing of the qualities each member of the group has in common with other members of the group, qualities by which they can be distinguished collectively. In the case of the genus *Lilium* those characteristics are indicated above. Plants differing in one or more respects from them are not true Lilies, but (irrespective of the common names by which we know them) belong to other genera.

Hemerocallis, the Day-Lily, does not have a bulb (see drawing); neither does *Convallaria*, the Lily-of-the-valley (drawing). *Gloriosa*, the very Lily-like Glory-Lily of tropical Africa, has tuberous roots, and its leaves are extended into tendrils (drawing). *Tulipa*, the Tulip, has a tunicated bulb (with the scales in



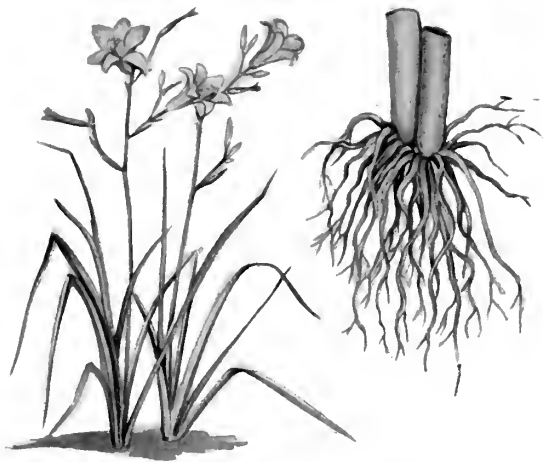
Cardiacrinum giganteum (*Lilium giganteum*): with flower and bulb



Deeply branched stigma of *Notholirion hyacinthina*



Three-lobed stigma of Regal Lily (*Lilium regale*)



Day-Lily (*Hemerocallis Thunbergii*), with fibrous roots



Plantain-Lily (*Hosta Fortunei*), with fibrous roots



Crown Imperial
(*Fritillaria imperialis*)

concentric layers) and anthers attached to the base. *Erythronium*, the Trout-Lily, has the stalk attached at the base of the anther. (Drawing.)

Flowers of *Zantedeschia*, the "Calla-Lily," or *Calla*, have neither sepals nor petals, the showy part being a large, fleshy, usually white spathe (drawing). *Hosta*, the Plantain-Lily, and *Agapanthus*, the Lily-of-the-Nile, are nonbulbous and have fibrous or fleshy roots



Spider-Lily (*Hymenocallis calathina*), with flowers in a true umbel



Western Trout-Lily (*Erythronium grandiflorum*), stalk at base of anther



Glory-Lily (*Gloriosa rothschildiana*), with tubers and tendrils

(drawings). *Hymenocallis*, the Spider-Lily, has its flowers in umbels that have brownish, papery bracts beneath them; and has a "corona" or veil connecting the anther stalks (drawing).

For these reasons, none of these so-called Lilies is a true Lily; and it becomes apparent that a Lily is a member of the genus *Lilium* because it has a group of characteristics found in representatives of no other genus of plants.



"Calla-Lily" (*Zantedeschia aethiopica*)



Lily-of-the-valley (*Convallaria majalis*), with fibrous roots



Lily-of-the-Nile (*Agapanthus umbellatus*), with flowers in a true umbel

LILIES THAT ARE NOT LILIES

How to grow them

Conrad B. Link

LILIES are so universally liked that it is not surprising that many plants with Lily-like flowers are referred to as "Lilies." Some of these plants are members of the Lily Family but not of the genus *Lilium*—the true Lilies. Many other plants which are commonly referred to as Lilies are not even closely related to them; and some of these have flowers quite unlike Lilies. Common names for plants are so variable that it is not possible to include, here, all of the plants that may be referred to as Lilies. Names often change and are different in the several sections of the world. The *Gladiolus*, for example, was called the Sword-Lily at one time; but now that name is rarely used for this popular plant.

In the Bible, Lilies are mentioned several times, the best-known reference being: "Consider the lilies of the field, how they grow; they toil not, neither do they spin: And yet I say unto you, That even Solomon in all his glory was not arrayed like one of these." (Matt. 6:28-29.) Many authors consider that these "Lilies of the field" were not the white Madonna Lilies so often associated with this passage, but rather may have been (among other possible plants) the brightly colored Poppy Anemones (*Anemone coronaria*). It is easy to see the glory in the brilliant reds, the rich lustrous lavenders and purples, or the golden yellows of these flowers, and to understand why even the royal robes of King Solomon could not compare with them. These Poppy Anemones are easily grown in the cool greenhouse. They should be planted in pots or flats in October or November, and will bloom in February and March.

Most of the so-called Lilies are bulbous or fleshy-rooted plants. In this group, we have such hardy spring-flowering bulbs as the western Trout-Lily (*Erythronium grandiflorum*), the Checkered-Lily (*Fritillaria meleagris*), and the Mariposa-Lily (*Calochortus*). These bulbs are planted in the fall like Tulip or Narcissus bulbs, and have the same general requirements. Not being large-growing plants, they lend themselves best to planting in groups, with perennials or in the rock garden. *Calochortus* should have winter protection in the North. (See PLANTS & GARDENS, Autumn, 1946, pages 170 to 173.)

Culturally, on the basis of winter-hardiness, these plants may be divided into two groups, tender and hardy.

Tender Group

The "Fairy-Lily" (*Zephyranthes rosea*), the "Peruvian Swamp-Lily" (*Zephyranthes candida*), and the Atamasco-Lily (*Zephyranthes atamasco*) are commonly grown house plants. If they are grown in pots they are kept in a cool light place over winter until the foliage dies. They may also be grown the same as *Gladiolus*: planted out of doors in the spring, lifted in the fall, and stored in soil over winter.

The Amazon-Lily (*Eucharis grandiflora*) is a bulbous plant which will flower two or possibly three times a year if grown as a cool greenhouse plant with a partial drying off of the bulbs after flowering. Another of the greenhouse subjects is the large and showy Spider-Lily (*Hymenocallis speciosa*). This one needs a warm temperature during the winter, and is rested during the summer months. Several species of *Crinum* have "Lily" as a part of the common name; the "Cape-Lily" (*Crinum longifolium*) is



Day-Lilies (*Hemerocallis*), with Astilbe and Veronica

Gottsch-Schleisner photo

perhaps the commonest. In the North, it is grown as a greenhouse plant.

The Glory-Lily, or "Climbing-Lily" (*Gloriosa Rothschildiana*) is an unusual flower. The plant is easily grown as a greenhouse subject; its tuberous roots should be potted in February or March. Outdoors it should be planted in a sheltered location, where it will grow 2 or 3 feet tall, and bloom until fall. The flower is bright red and yellow, changing to deep scarlet. The fleshy roots may be lifted and stored over winter.

The "Corn-Lily" (*Ixia*) is usually grown under glass as a winter cut flower—planted in September or October, and grown in a cool temperature. If planted outdoors it is cared for as is the Gladiolus. The Jacobean-Lily (*Sprekelia formosissima*) is planted outdoors after danger of frost is over, and will flower in late June or early July. The bulbs are dug and stored over winter in a warm dry place.

The "Calla-Lily," or Calla (*Zantedeschia aethiopica*) is frequently grown in the greenhouse, and occasionally outdoors during the summer. The fleshy roots are potted in September or October, and grown in a cool temperature (50° F.). A large root will produce several flowers during the winter. The Golden "Calla-Lily" (*Zantedeschia Elliottiana*) is potted in December or January, and flowers in March or April. Its white-spotted leaves add to its attractiveness. The blue Lily-of-the-Nile (*Agapanthus africanus*) grows best as an established plant in a large tub or pot, where it can be stored over winter in a cool greenhouse.

The Chinese Sacred-Lily (*Narcissus Tacetta* var. *orientalis*) is a well-known, easily forced bulb for winter bloom in the home. If it is well rooted before it is brought into the light, it can easily be in flower in December or later during the winter months.

Winter-hardy Group

Desert-candles, or "Foxtail-Lilies" (*Eremurus robustus* and varieties) pro-

duce the largest flower clusters of all the hardy bulbs—4 to 8 feet tall. They should be planted in a fertile, well-drained soil. In the North, they should be mulched during the winter. The leaves appear early in the spring, and disappear after flowering.

"Peruvian-Lilies" (*Alstroemeria*) are summer-blooming perennials. *Alstroemeria chilensis* is hardy with winter protection in the North. It flowers in June and July, with creamy white, yellow, orange, pink, or red flowers. The tender species are stored over winter in a cool place, the same as Dahlias.

The Day-Lily (*Hemerocallis*), one of whose species is called "Lemon-Lily," is one of the most satisfactory of our hardy perennials. The plants are free-flowering, pest-free, winter-hardy, and adapted for growing practically anywhere. The great interest in these plants in all sections of the United States is due to these factors, plus the greater variety of colors now available, ranging from clear light yellow to deep orange, red-orange, bronze, and combinations approaching red-purple. The period of bloom has been extended, by breeding and selection, from June to late August and early September. The growth habits of the newer varieties range from comparatively dwarf types to those 4 to 5 feet tall.

Plantain-Lilies (*Hosta*) are among the best of the flowering perennials for growing in partial shade, along the margin of water, or (the shorter-statured kinds) as edging for beds or paths. They grow best in a fertile soil, producing an abundance of foliage, and white or blue flowers in late summer. They are sometimes planted as a ground cover to shade the soil for true Lilies. The foliage blends well with Lily foliage and makes an appropriate combination. (See PLANTS & GARDENS, Autumn, 1947, pages 186 to 189.)

The Blackberry-Lily (*Belamcanda chinensis*) produces narrow Iris-like leaves, and red-spotted orange flowers in

August. It is an easily grown perennial, which does best in full sun. It is propagated by seed or by division. The large black seeds are produced in clusters resembling enormous blackberries.

The Lily-of-the-valley (*Convallaria majalis*) is an old stand-by in the perennial garden for shady places. If the plants are fertilized in late summer or fall, especially where they compete with trees or other large plants, they will thrive and produce an abundance of bloom each spring. Where they become too thick, it is advisable to replant them every few years.

No list of "Lilies that are not Lilies" would be complete without mention of the Water-Lily (*Nymphaea*). The hardy kinds are easily grown in small pools, or even in tubs sunk in the ground; but the tropical varieties require a little more room. A pool 40 to 50 square feet in area provides sufficient surface for one plant of a tropical variety, or one or two plants of any of the hardy varieties. The charm of a garden pool is enhanced by the glossy leaves and striking flowers of Water-Lilies. (See PLANTS & GARDENS, Summer, 1945, pages 88 to 96 and 105 to 107.)



Hardy Water-Lily Gladstone

ENLARGING THE GARDEN

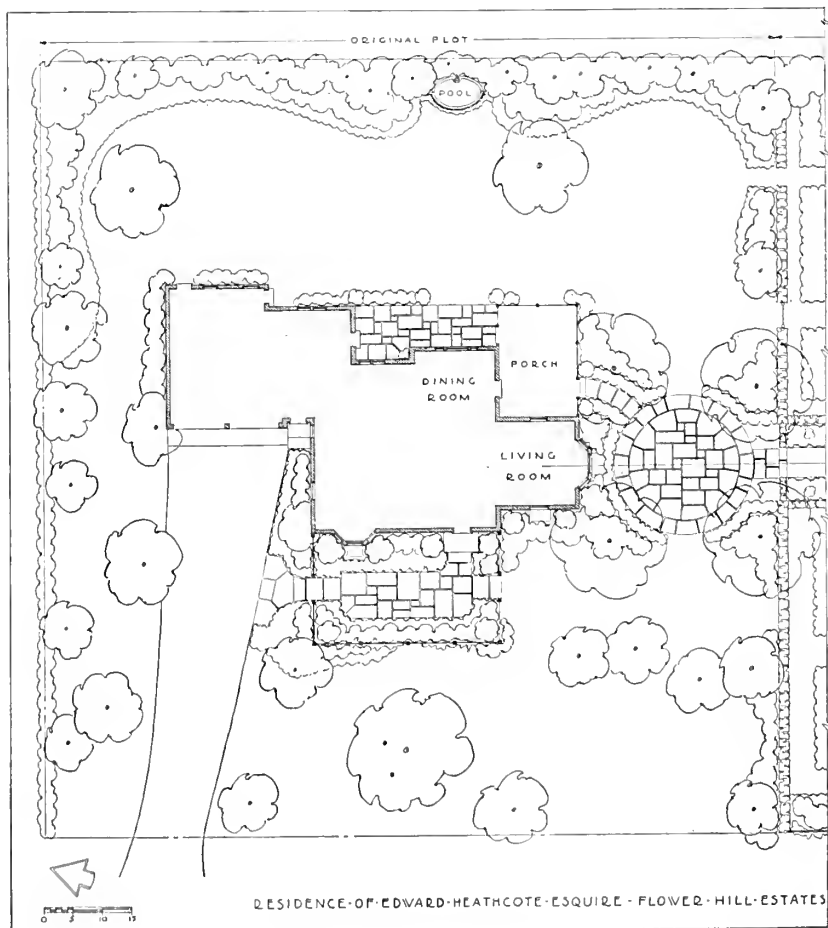
A dream come true

Philip Luther Robinson

ARE you one of the thousands of gardeners whose hobby eventually outgrew their land? "I'd like a separate Rose garden, but I haven't enough room. I'd like to start a collection of Peonies, but I can't find space for them. I wish I had land enough for a greenhouse, and some Raspberry bushes, and an Asparagus bed, and a Strawberry patch —." Have you ever muttered similar thoughts, as you vainly searched for an unused

square yard of garden space? Have you cast envious eyes on your neighbor's weed patch, seeing it in your mind's eye lush with your well-tended specimens?

If you are one of these frustrated gardeners, you can appreciate the joy in the heart of this enthusiast who found that he could acquire the vacant plot adjoining his grounds. The gardens of his dream, in which he could assemble the many flowers, shrubs, and flowering trees that took his fancy, were assured. The new piece sloped gently toward the south, an ideal exposure for most plants. The soil was gravelly clay, slightly acid, cov-



ered with weeds, brush, and wild trees. The addition of phosphorus and plenty of leaf mold or well-rotted manure would make it suitable for most kinds of plants.

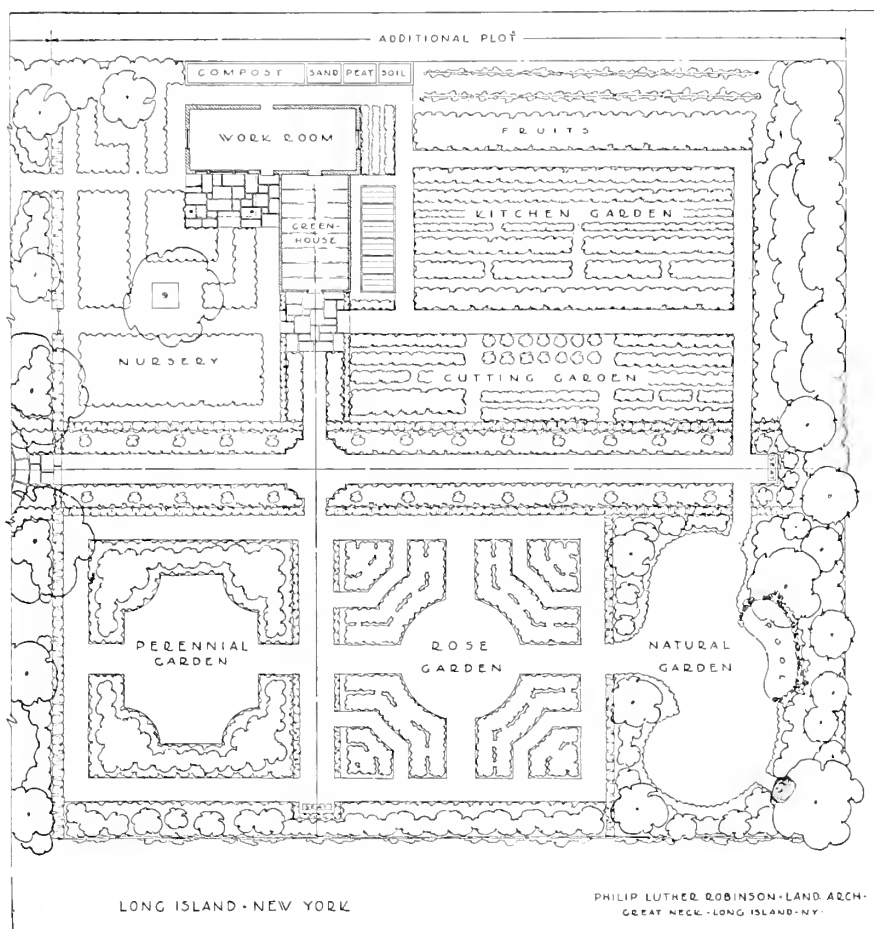
General Layout

Among the requirements for the use of the new land was the development of a service area. This was to include a small "Orlyt" greenhouse* connected with a building containing heater room, tool room, potting bench, sink, toilet, and storage space for supplies. Pits for storage of potting soil, sand, peat, and compost must be near at hand. A battery of cold frames and a nursery plot would complete this section.

*A prefabricated greenhouse that comes in sections for assembly with bolts and screws.—Ed.

Also to be accommodated was a kitchen garden for fruit and vegetable culture, and a cutting garden for annuals and surplus perennials. The plan shows the eventual layout of these special areas, nicely grouped for easy handling.

The rest of the area was to be developed as a series of gardens for special purposes. A Rose garden, for testing the newer varieties as well as those of earlier origin, would cover a considerable space. A so-called perennial garden would accommodate a choice selection of herbaceous specimens. A "natural garden" would form a setting for ericaceous plants, dwarf perennials, and bulbs. For ease of maintenance and the best utilization of space the gardens were formalized. It has proved to be





Before the
enlargement
of the garden

Author photos

easier and less expensive to mow, edge, and cultivate beds and grass plots of definite form than those that are irregular in outline. Even the natural garden, which lacks formal symmetry, has a certain regularity and balance of shape.

The separation of the highly refined gardens from the service and utility areas was accomplished by the development of an allee on the axis which springs from the windows of the living room of the residence. This allee is in the form of a long, straight turf walk bordered with flower beds and Yew hedges. It terminates at a marble bench placed against a

background of evergreen trees and shrubs.

A path on the axis of the greenhouse crosses the allee, separates the rose and perennial gardens, and ends at another bench. These axial paths tie individual areas together and develop lines of logical circulation.

Japanese Yew hedges separate the three gardens and simulate the walls of these out-of-door rooms. To give variety and to provide support for climbing Roses, a post and rail fence separates the gardens from the road. The fence also tends to soften the aspect from the other



After
enlargement
and development



residences in this community of semi-rural feeling.

Special Gardens

The Rose garden contains some thirty-five varieties of Hybrid Tea Roses and Hybrid Polyanthas (Floribundas). These are in the central beds, which were deeply dug and manured. Hybrid Perpetuals, Mosses, and species Roses form a light screen planting along the fence. Floribundas face off this planting. Teas and Floribundas are spaced about 18 inches, the shrubby types as much as 4 feet.

In the spring the perennial garden abounds with Irises and herbaceous Peonies, with Delphiniums, Coral-bells, Painted Daisies (*Chrysanthemum coccineum*), Columbines, and garden Pinks as fillers. Phlox and annuals carry the blooming period through the summer months. Chrysanthemums, in considerable variety, provide a fine show of color in the autumn.

The beds in the allee contain a collection of tree Peonies as accent points. Between the Peonies are planted solid blocks of Darwin and Breeder Tulips, shading from dark reds, purples, and bronzes at the end toward the house to light pink, yellow, and white at the opposite end. Pansies are used as an edging. After the Tulips have faded, the beds are planted to colorful annuals, biennials, and perennials from the nursery rows.

The natural garden features a kidney-shaped Water-Lily pool nestled at the foot of a slight eminence on which grow various conifers, Dogwoods, and Azaleas. Flowering trees, Azaleas, and rock plants occupy the other beds. Dwarf annuals and bulbous plants prolong the blooming season.

Various Lily species and hybrids have been grouped in the perennial garden, in the natural garden, and among the more dwarf shrubs on the original plot. Among them may be found Madonna Lilies (*Lilium candidum*), Goldband Lilies (*Lilium auratum*), Regal Lilies (*Lilium regale*), Showy Japanese Lilies (*Lilium speciosum*), *Lilium umbellatum*, *Lilium Henryi*, and the Estate variety of the Easter Lily (*Lilium longiflorum*). It is planned to add many more varieties if the soil proves suitable for bulbous plants.

The gardens have been in operation for less than one year, but already the owner believes that the money and effort have been well spent. The collection of tree Peonies is already extensive. Those of Irises, herbaceous Peonies, Roses, Lilies, and Azaleas are beginning to take shape. Cut flowers and vegetables are available in quantity for the house; and many delightful week-end hours have been spent by the owner in healthful labor and meditation among his treasures. Surely a garden enthusiast could ask for little else here below.

MIDSUMMER FLOWERS

For a garden gay

Isabella Preston

WHEN the Irises, Peonies, Lupines, and Delphiniums are over, there is often a scarcity of bloom in a perennial border. There is no need for this, as there are many showy plants which bloom in late June and July. Lilies, which are the most spectacular, are discussed elsewhere in this issue of PLANTS & GARDENS, and so I only mention them here.

Yellow

Day-Lilies (*Hemerocallis*) should be used more at this season. The date of blooming varies according to the part of the country where the plants are growing; and so my selection of varieties will not be suitable for all districts. The following are a few that make a good display in July. Mikado has large orange flowers banded with mahogany red. Soudan is very floriferous, and the large yellow blossoms are fragrant. Gaiety and Hyperion are two other useful ones, and there are many more. All of them are easy to grow, and continue to bloom in the hottest days of summer when most perennials show signs of wilting. (See PLANTS & GARDENS, Summer, 1947, pages 94 to 96.)

Another useful yellow-flowering plant that does not "mind" the heat is Heliopsis. There are numerous varieties; *Incomparabilis* is a great favorite. They make excellent cut flowers as well as being attractive in the garden. They have one bad fault from the gardener's point of view: they become covered with aphids if they are not kept sprayed throughout the season.

Blue

Blue flowers look well with yellow ones—clumps of Bellflowers (*Campanula*),

for example. The Tussock Bellflower (*Campanula carpatica*) makes an excellent ground cover, and the blue cup-like flowers continue to open for weeks; its variety *alba* is also very attractive. The best-known of the tall-growing species is the Willow Bellflower (*Campanula persicifolia*), which makes handsome clumps in sun or partial shade. The variety Telham Beauty has much larger and more open bell-shaped flowers than the true species. There are double-flowering forms, too; these, when well grown, look like new kinds of Delphinium. *Campanula glomerata* var. *dahurica* has rich purple blossoms clustered around the top of the stem. The Milky Bellflower (*Campanula lactiflora*) "likes" a shady place in fairly moist soil. The flowers are very faintly colored, and are generally described as milky white. The plant grows 3 to 4 feet tall. The Great Bellflower (*Campanula latifolia*) has large, bell-shaped, semi-erect, purplish flowers. It makes a handsome clump for the back of the border; but it is inclined to spread, and may overrun some weaker-growing plant if it is not kept in check.

Another useful blue-flowering plant is Dragonhead (*Dracocephalum fruticulosum*), frequently listed as *Nepeta Souvenir d'André Chaudron*. It has large blue flowers arranged in spikes 18 inches long; it comes into bloom in June and continues all summer. The plant is inclined to lie on the ground, and so it soon takes a large space. The flowers are a truer blue than the Bellflowers, and are very attractive.

A tall-growing Speedwell (*Veronica maritima* var. *subsessilis*), has small, rich blue flowers arranged in a long narrow spike about 3 feet tall, and blooms all summer. It increases rapidly, and soon makes a large clump. Like many other

strong-growing perennials, the plants should be divided about every third year.

Erigeron has Daisy-like flowers, lavender-blue in color. In Merstham Glory the flowers are semidouble, and the plants grow about 2 feet tall. Mrs. E. H. Beale has a more compact habit of growth. Both varieties flower all summer.

Two pink-flowering perennials should be mentioned. The Tree-Mallow (*Lavatera cachemiriana*) grows into a large bushy plant up to 5 feet. The flowers are somewhat like small, single Hollyhocks, and are a beautiful shade of pink. *Lythrum Morden Pink* has dense spikes of rose-pink flowers. It is very hardy; it soon makes a good clump, grows about 3 feet tall, and blooms all summer.

White

Plants with white or cream-colored flowers are useful to separate colors that might clash if planted near together, and also to add interest when the daylight is nearly gone. The pure white Phlox Miss Lingard blooms about the right time.

Chrysanthemums, to most people, are the autumn-flowering kinds; but there are several that bloom in the summer. Alaska, Monarch, and Mount Shasta have large white Daisy-like flowers, and bloom for weeks. They do well in ordinary soil, but need to be divided every few years. Esther Read is a different type; the white flowers are double; the plants will grow up to 2 feet if the position suits them, and will continue to bloom all summer. The leaves are like those of Shasta Daisies, but the flowers are more like Pyrethrums. A few young plants should be kept in a cold frame over winter in districts where the winters are severe. The soil should be a good one that does not dry out.

An entirely different kind of plant, which has compound leaves and large panicles of small creamy white flowers that stand well above the foliage, is Goats-beard (*Aruncus sylvestris*, sometimes listed as *Spiraea Aruncus*). It grows 4 to 5 feet tall. Its variety



Author photo

Willow Bellflower (*Campanula persicifolia*)

Kneiffii grows about 3 feet, and has finely dissected leaves. Even after the petals are faded, the seed pods are attractive. The plants "prefer" rather rich soil that does not dry out, and do well in partial shade.

Mixed Colors

Astilbe is another plant that was at one time classed as a *Spiraea*. A kind sold by florists at Easter is very similar to the hardy ones which have been used in the development of the garden varieties. The plants have clusters of small flowers in the form of plumes. They need plenty of moisture and shade to grow well, and should be in fairly large groups to make a good effect. The height varies from 18 inches to 3 feet, according to the variety: Ceres and Crepuscule are pale pink, 2 to 3 feet; Diamant, pure white, 2 to 3 feet; Fanal, blood red, 18 inches.

With careful planning, a midsummer garden can be full of brilliant bloom.

WITHIN THE BROOKLYN BOTANIC GARDEN

HARVEST OF THE WORLD DINNER



Benefit sale of plants in the Garden on Garden Club Day—Brooklyn Botanic Garden Week

From all corners of the earth, on the wings of Pan American World Airways, Inc., Eastern Airlines, Avianca, and Air France, came the foods that made up the Harvest of the World Dinner held in the Rotunda on May 3. There were such delectables as South African rock lobster, pitaya and granadilla from South America, field-ripened pineapples from Puerto Rico, native guinea hen and wild rice, and platanos, and some twenty different cheeses from fifteen countries.

After the dinner Fairfield Osborn, author of *Our Plundered Planet*, and Professor Richard Bradfield of Cornell University, discussed the problem of the world's food supplies and increasing population.

ARTHUR HOYT SCOTT AWARD

Miss Ellen Eddy Shaw, who taught children at the Garden for thirty-three years, until her retirement in 1945, has received this year's Arthur Hoyt Scott Garden and Horticultural Award. Her citation reads: "No one has ever done work of a similar magnitude in interesting children in gardening, in plant life, and in nature." This is the second time in its eight-year history that the Scott Award has come to a Brooklyn Botanic Garden staff member. Dr. C. Stuart Gager, former Director, received it in 1942.



Miss Shaw showing children how to pot plants

BROOKLYN BOTANIC GARDEN OF THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES

Officers of the Institute

ADRIAN VAN SINDEREN
President

SIDNEY W. DAVIDSON
First Vice-President

CHARLES PRATT
Second Vice-President

ROBERT E. BLUM
Third Vice-President

EDWIN P. MAYNARD
Treasurer

DONALD G. C. SINCLAIR
Secretary

Ex Officio Members of the Board

WILLIAM O'DWYER, *Mayor of the City of New York*
LAZARUS JOSEPH, *Comptroller of the City of New York*
ROBERT MOSES, *Commissioner of Parks*
JOHN CASHMORE, *President of the Borough of Brooklyn*

Botanic Garden Governing Committee

LEONARD P. MOORE, *Chairman*

MISS HILDA LOINES, *Vice-Chairman*

WILLIAM G. CREAMER
LEWIS L. FAWCETT
MRS. LEWIS W. FRANCIS
PAUL F. FRESE
ANDREW J. GONNOUD
WALTER HAMMITT
WILLIAM T. HUNTER

EDWIN P. MAYNARD
JOHN C. PARKER
RUTHERFORD PLATT
MRS. THOMAS H. ROULSTON
PAUL D. SHAFER
DONALD G. C. SINCLAIR

BERNARD H. SMITH

ADRIAN VAN SINDEREN, *Ex officio*

Director of the Botanic Garden

GEORGE S. AVERY, JR.

TO VISITORS

To reach the Garden:

By SUBWAY: from Manhattan, twenty-five to thirty minutes' ride from Times Square or Grand Central.

I.R.T., West Side (7th Avenue or Broadway-7th Avenue line), downtown express marked "New Lots Avenue" or "Flatbush Avenue," to Eastern Parkway-Brooklyn Museum Station.

I.R.T., East Side (Lexington Avenue line), downtown express marked "New Lots Avenue" or "Utica Avenue" or "Atlantic Avenue," to Nevins Street, step across platform and change to 7th Avenue or Broadway-7th Avenue train, ride to Eastern Parkway-Brooklyn Museum Station.

B.M.T., Brighton Beach line, downtown express or local to Prospect Park Station.

By AUTOMOBILE:

From Long Island, take Eastern Parkway westward, and turn left at Washington Avenue.

From Manhattan, take Manhattan Bridge, follow Flatbush Avenue Extension and Flatbush Avenue to Eastern Parkway; follow the Parkway to Washington Avenue, then turn right.

PLANTS & GARDENS

Autumn, 1949

Dwarf and Low-growing
or Slow-growing Plants

—

Shrubs for Low Hedges

—

Artificial Dwarfing

—

Old Dwarfs on Long Island

—

Foundation Planting

—

Propagating Dwarf Conifers



AMONG THE CONTRIBUTORS TO THIS ISSUE

J. W. ADAMS, Curator of the Herbarium of the Morris Arboretum, University of Pennsylvania, and an authority on the native plants of his region.

RICHARD H. FILLMORE, Propagator at the Arnold Arboretum, Jamaica Plain, Massachusetts.

WILLIAM PENN MOTT, JR., Superintendent of Parks of Oakland, California, and an accomplished horticulturist and landscape architect.

B. O. MULLIGAN, Director of the University of Washington Arboretum, Seattle, Washington.

JOHN B. NOMER, Assistant Horticulturist at the Brooklyn Botanic Garden.

ALFRED REIDER, late Emeritus Associate Professor of Dendrology at Harvard University, and former Curator of the Herbarium at the Arnold Arboretum; internationally recognized as the greatest authority on woody plants; author of *Manual of Cultivated Trees and Shrubs*, and a vast number of short articles. His *Bibliography of Cultivated Trees and Shrubs hardy in the cooler temperate regions of the Northern Hemisphere* appeared only one month before his death.

CARL STARKER, horticulturist and nurseryman of Jennings Lodge, Oregon, giving special attention to dwarf plants.

HENRY TEUSCHER, Curator of the Montreal Botanical Garden, Montreal, Quebec, Canada, and well-known authority on woody plants.

MAUNSELL VAN RENSSELAER, Director of the Santa Barbara Botanical Garden, Santa Barbara, California, and author of the book *Trees of Santa Barbara*.

DONALD WYMAN, Horticulturist at the Arnold Arboretum, Jamaica Plain, Massachusetts, and author of the recent books *Hedges, Screens, and Windbreaks and Shrubs and Vines for American Gardens*.

PLANTS & GARDENS



Tulipa Batalinii

Vol. 5

Autumn, 1949

No. 3

CONTENTS

Cover—Dwarf Pine at the Brooklyn Botanic Garden	
Among the Contributors to this Issue	Page 2 of Cover
Frontispiece	An English Ivy planting around a small pool at the Brooklyn Botanic Garden 130
Director's Letter	131
Dwarf Shrubs for Low Hedges	Donald Wyman 132
Heaths and Heathers	Carl Starker 136
Abbott's Pigmy Hemlock	Henry Teuscher 141
Dwarf Californian Shrubs	Maunsell Van Rensselaer 142
Dwarf Rhododendrons at Seattle	B. O. Mulligan 145
Artificially Dwarfed Trees	William Penn Mott, Jr. 149
Old Dwarfs in Long Island Gardens	George S. Avery, Jr. 154
Foundation Planting	Henry Teuscher 161
A Handsome Dwarf Spruce	Henry Teuscher 164
Compact Form of Colorado Spruce	Alfred Rehder 165
The Unique Box Huckleberry	J. W. Adams 166
How to Propagate Dwarf Conifers	Richard H. Fillmore 169
Dwarf and Low-growing or Slow-growing Plants	John B. Nomer 172
Within the Brooklyn Botanic Garden	192
Drawings by MICHAELNA L. CARROLL, except those on page 191, which are by WINIFRED HADDOCK.	

HENRY TEUSCHER, *Guest Editor*

MICHAELNA L. CARROLL AND HESTER M. RUSK, *Assistant Editors*

Published quarterly at Prince and Lemon Streets, Lancaster, Pa., by the Brooklyn Botanic Garden, Brooklyn, N. Y.
Entered as second-class matter, May 26, 1945, at the post-office at Lancaster, Pa., under Act of August 24, 1912.
Subscription included in Botanic Garden membership dues. To others: \$2.00 per year; \$3.50 for two years.
Copyright, 1949, by the Brooklyn Botanic Garden

NOTICE OF CHANGE OF ADDRESS AND ALL OTHER CORRESPONDENCE
SHOULD BE ADDRESSED TO:

BROOKLYN BOTANIC GARDEN, BROOKLYN 25, N. Y.



An English Ivy planting around a small pool at the
Brooklyn Botanic Garden

Except where otherwise credited, photos by Louis Buhle

THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES
BROOKLYN BOTANIC GARDEN
1000 WASHINGTON AVENUE
BROOKLYN 25, NEW YORK
TELEPHONE: MAIN 2-4433

Autumn 1949

About Dwarf Plants:

The object of this issue is to acquaint readers with a large selection of hardy woody plants that are naturally small; about four hundred of them are described here. Many of these have a real place in contemporary gardens; while others are "collectors' items."

Current trends are for smaller gardens, or for gardens that do not require too much attention in the way of pruning and frequent moving of specimens as they outgrow their situation. Plants that develop slowly seem to be the answer -- plants that are good for ten to fifty years without excessive growth. Naturally, one would not choose a dwarf tree for shade, but there are dwarfs for almost every other purpose.

Here are the three categories of dwarf plants.

1. Dwarf or diminutive varieties of species that are normally large. Examples are Dwarf White Pine and Dwarf Hemlock. But these and others, when old, become plants of fair stature (p. 155).
2. Dwarf species. In many genera of ornamental plants, such as Rhododendrons, Spireas, and Willows (pp. 145, 187-189), certain species are characteristically small. Dwarfness is in their inheritance, "in their blood," so to speak, and they and their offspring continue to be small -- regardless of the conditions under which they grow. Many of them have a habit of spreading close to the ground instead of growing upright; and some horticulturists think of them as just low-growing plants -- not dwarfs at all. Every man to his choice of names, as long as the facts are not distorted!
3. Artificial, or cultural dwarfs. As a result of special cultural practices, it is possible to keep specimens that might normally grow to fifty or one hundred feet in as many years -- to a height of a foot or two. The famous Japanese potted trees are outstanding examples (p. 149).

Our Guest Editor for this issue is Mr. Henry Teuscher of the Montreal Botanical Garden. Mr. Teuscher and the authors he has chosen speak with authority; it is a great pleasure to welcome them to the pages of PLANTS & GARDENS.

George S. Remy, Jr.
Director

DWARF SHRUBS FOR LOW HEDGES

How to select and use them

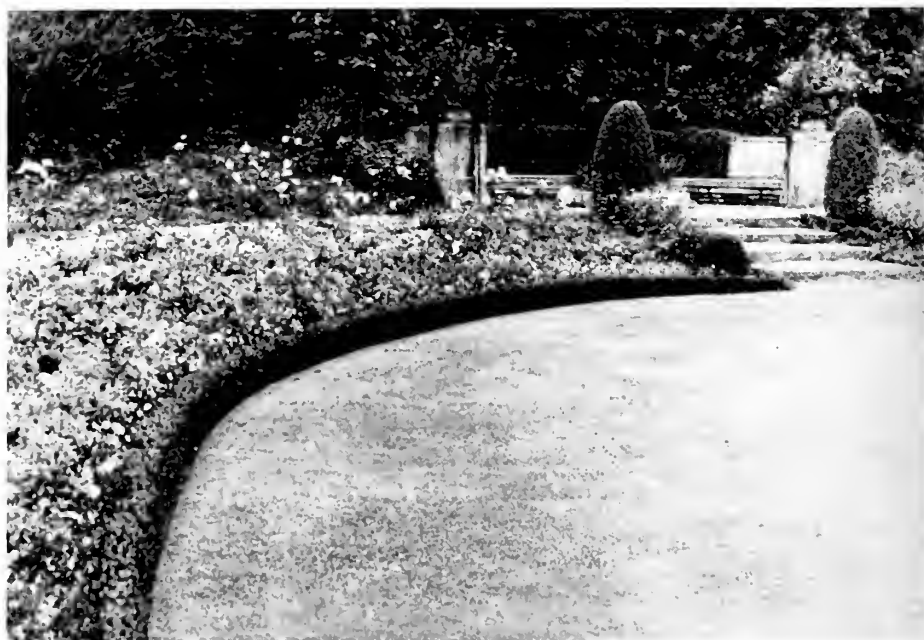
Donald Wyman

THERE are not too many dwarf shrubs—really dwarf shrubs—that are suitable for use in low hedges; and so one must be discerning in selecting just the right one for just the right place. A dwarf shrub for a low hedge should be neat and compact, and should require practically no attention except a quick pruning occasionally to keep the plants in conformity.

One important point should be kept in mind: there are no dwarf shrubs which can truly be considered barrier plants in

the same manner as Japanese Barberry or the Japanese Rose (*Rosa multiflora*). The dwarf plants remain (or are kept pruned) under 3 feet in height, and as such form no efficient barrier to pedestrians, pets, or children. Hence they are considered merely as markers, or plants used to emphasize the edge of a path, the front of a border, or a property line.

Usually such plants are desirable if they are upright in habit and not sprawling. *Cotoneaster horizontalis* is a splendid plant for the bottom of a bank or for overhanging a rock wall but is not in place if used as a formal edging. Far better is the popular dwarf Box (*Buxus sempervirens suffruticosa*) or one of its



Author photo

Dwarf Box (*Buxus sempervirens* var. *suffruticosa*), a common favorite for edging

A flowering branch of
Slender Deutzia (*Deutzia
gracilis*)



several hardier substitutes. (See page 134.)

Low hedges should be placed properly in relation to border and walk, and the plants should be allowed sufficient space so that they will not be cramped when they have reached the size at which they are to be maintained. Given a quick pruning now and then to keep them growing in the proper shape, they should require little attention.

Deciduous

Two Barberries might be mentioned: *Berberis Thunbergii erecta* and *Berberis Thunbergii* var. *minor*. Both have the good, sturdy qualities of their popular relative, the Japanese Barberry (*Berberis Thunbergii*); but both are less vigorous in growth and lend themselves readily to restraining pruning. The upright-growing form (*erecta*) merely has to be topped at long intervals. The little-leaved Japanese Barberry (var. *minor*) is mounded in habit, has smaller leaves than the species, and is much better adapted to a rounded low hedge, or even an informal hedge if such is desired. Both can be kept at any height under 3 feet by correct pruning; and they are not susceptible to any serious disease or insect ills. These come closest to being barrier low hedges,

but practically they are not high enough to serve well.

The true Dwarf Japanese Quince (*Chaenomeles japonica*) is a low-growing shrub with bright red flowers, and is very pretty in its bushy vase-shaped habit of growth. Much lower in habit than the common Quince, it can be considered in this low group of dense-growing shrubs; and it is readily restrained.

The Slender Deutzia (*Deutzia gracilis*) might be considered for an informal, flowering, 3-foot hedge; it is very beautiful in flower, but not reliably hardy north of New York.

The Dwarf Common Privet (*Ligustrum vulgare* "Lodense") has been used a good deal also; but in certain areas it is susceptible to a bad blight, and so it is not dependable everywhere.

There are two small-leaved Honeysuckles that warrant attention, for they both make excellent small hedges. The Box Honeysuckle (*Lonicera nitida*) is evergreen in the South and can be used as far north as Washington. It is a native of China; it has creamy white, fragrant flowers in June, and small leaves only about $\frac{1}{2}$ inch long. It is supposed to withstand salt spray. The Privet Honeysuckle (*Lonicera pileata*), with leaves up to $1\frac{1}{2}$ inches long, is hardier



Author photos

Euonymus Fortunei var. *radicans* used informally over a line of rocks. Both this and the variety *vegeta* can be clipped formally if desired

(can be used in New York), and has horizontal branching and handsome glossy green leaves. This will withstand some shade; it will grow only about 4 feet tall, but can be kept considerably lower by pruning.

Various forms of the Kurume Azaleas are used (especially *Rhododendron obtusum* var. *amocnum*), and kept formally clipped with good results.

The common Lavender and Germander (*Teucrium Chamædrys*) are only two of several suggestions one might find among the shrubby herb garden plants.

Even the Alpine Currant (*Ribes alpinum*) has been used. The male form is free from carrying the White Pine blister rust; but unfortunately the quarantine authorities have not yet recognized this quality, and so it is almost impossible to obtain this excellent plant from nurseries.

One of the Viburnums, the European Cranberry-bush (*Viburnum Opulus* var. *nanum*), could be considered; but usually on close examination one comes to the conclusion that even though it is low and

compact, its rather large coarse leaves are against it for diminutive surroundings.

Evergreen

By far the better edging materials are to be found among the evergreens. The merits of the dwarf Boxwood (mentioned in the second paragraph) are widely known. This is none too hardy in New England, where several fine varieties of the Japanese Holly (*Ilex crenata*) are used instead. *Ilex crenata* var. *convexa* is the best substitute, but alas it is rather vigorous in growth; *Ilex crenata* "Kingsville" and var. *Helleri* are dwarf, very slow-growing forms, mound-like in habit, and make excellent substitutes for the dwarf Box in areas where the latter is not hardy. The Korean Box (*Buxus microphylla* var. *koreana*) is the hardiest of the Boxwoods, and might be tried in areas where the dwarf Box proves tender.

One Arbor-vitae might be mentioned: "Little Gem," a dwarf compact form (var. *pumila*) of the native American Arbor-vitae (*Thuja occidentalis*). Plants of this variety grow very slowly and need practically no pruning at all. They grow



The Hicks Yew (*Taxus media* var. *Hicksii*), one of the many Yews splendid for hedge purposes. Picture taken one year after planting

into a uniform hedge, with rounded and only slightly uneven outline. Arborvitae can not be grown well everywhere. They seem to like a fairly cool and moist atmosphere, and so had best be used where summers are not too hot and dry.

Swiss Mountain Pine (*Pinus Mugo*) could be considered, especially the very dwarf variety, *Pinus Mugo* var. *Mughus*; or var. *Pumilio*; both are low prostrate shrubs. Care should be taken to spray them properly if they are used in an area where scale insects may infest them.

The "Evergreen Bittersweet" (*Euonymus Fortunei* var. *vegeta*) makes an interesting low border if kept about a foot high. Its sturdy evergreen leaves and bright fruits lend themselves to this type of growing, although it is usually used as a shrubby vine attaching itself to buildings.

Pachistima Canbyi is another possibility among the broadleaf evergreens. Although I have never seen it as a low hedge, I see no reason why it could not be used in this way. Clipped once or twice a season, it could be grown 6 to 12 inches tall; with its dark green leaves in sum-

mer and its purplish autumn and winter foliage, it would be an interesting border plant.

The best of these bordering plants are found among the Yews, plants which look well every day in the year. The Dwarf Japanese Yew (*Taxus cuspidata* var. *nana*) might require less care and trimming than some of the others; but even young Hicks Yew (*Taxus media* var. *Hicksii*) has been used in this manner, and has been properly restrained for years by stiff pruning of the top. The dwarf Ground-Hemlock (*Taxus canadensis* var. *stricta*) is another that is recommended in various quarters; it does well in shade but is not quite so hardy or resistant to winter burning as are the forms of Japanese Yew. Another Yew that should be mentioned is *Taxus baccata* var. *repandens*, the hardiest of the English Yews, and the only one (here in the North at least) with slightly pendulous branchlets. Plants of this variety grow into excellent ornamental specimens, and should quickly form low, rather wide hedges. All of these varieties of Yew are splendid possibilities for low hedges.

HEATHS AND HEATHERS

Many of them dwarf

Carl Starker

THE Heather group is a most valuable one for the home gardener; there is no group of plants known that can afford more interest and pleasure. With proper selection, the gardener may enjoy their color for a very long period—which on the Pacific coast, at least, means the whole year. In more severe climates one may be considerably more limited as to variety; but the selection available in the various Heaths and Heather is ample, and their wide variety in size and form and color (as well as habit of growth) recommends them particularly for wider acquaintance. As yet they have been too little tried in many parts of the country. The various ways that Heaths and Heather may be used, and the ease with which their size and shape may be controlled, are amazing. It would be difficult to find another group of plants so free from insects and diseases.

The Heaths and Heather are shrubby plants, ranging in height from 3 inches to 20 feet, according to species. They vary from the absolute prostrate, to the very stiff erect shrub or small tree.

The Heaths (*Erica*) have small needle-like leaves, which are usually of a blue-green tone but may take on a yellow-green hue in some of the white forms.

The Heather (*Calluna*) include the Scotch Heather or Ling of the British Isles (*Calluna vulgaris*). Their leaves are scale-like and overlapping, and may be bronze, blue-green, or yellow-green in color effect. Many of them take on interesting winter colors in deep bronze and purple.

Culture

Growing Heaths or Heather is easy if a few simple but important considerations are observed. These plants need an open situation in sun, to bloom and grow well. In too much shade they are apt to be spindly in growth and lacking in bloom. The lower sorts are well adapted to banks or rockeries, and do nicely in borders, as edgings, or as ground covers for Rhododendrons and Azaleas. Generally speaking, they need a well-drained soil that is lime-free, and a generous addition of humus or peat from time to time. Pruning is very beneficial to these plants; it should be done soon after the blooming period. Plants well cut back always present a compact and tidy appearance, while those left alone get thin and sprawly and lose their neat and pleasing effect. Pruning promotes a vigorous growth; but more important for the health of the plant are proper fertilization and an adequate moisture supply. Feeding should be done in early spring, with an acid-type fertilizer; and a second feeding should be given in about six weeks. Late summer feeding should be avoided, as it tends to make soft growth that will not be properly matured before winter sets in. Proper selection of plants can produce year-round color—if not in flower, then in foliage effects, in gold or copper-red or purplish tones.

The propagation of Heaths and Heather presents no difficulties. Cuttings root readily in a covered frame in midsummer or may be taken in the fall. By heaping sand and peat around the crowns of the plants, one may easily induce the individual shoots to root as layers. Prostrate branches often root by themselves all around the plant, and may be severed and



McFarland photo

A hybrid Heath (*Erica darleyensis*)

transplanted as soon as sufficient roots have been developed.

Heaths

Perhaps the best-known winter-blooming Heath is the hybrid *Erica darleyensis*, with its showy spikes of pinkish purple flowers from November to March. It will reach about 18 inches in height. While it is yet in bloom other sorts begin to flower.

The Spring Heath (*Erica carnea*) "King George" is a very fine and colorful sort that blooms early. "Snow Queen" blooms in profusion about Christmas time, here in the Northwest; while "Springwood White" and "Springwood Pink" are a pair of lovely prostrate forms, whose mats of good foliage and profusion of bloom are most welcome at a season when little else is in flower. When they are out of bloom their low compact foliage

mass is most effective as a ground cover. *Erica carnea* var. *Vivellii* is a very colorful sort, with deep purplish foliage and carmine red blossoms in profusion. It is particularly low-growing, and is very effective when planted in mass or even as a rock garden specimen. *Erica carnea* var. *coccinea* is another deep-toned sort that is very telling in garden effect. "George Rendel" is a taller and somewhat later sort, of good bright pink color and fine habit. It will grow to about 14 inches in height.

The Tree Heath (*Erica arborea*) will grow to 18 or 20 feet. It bears a profusion of tiny white flowers, and has very fine-cut light green foliage. It is perhaps not for the coldest climates, but it is well worth trying, since it starts blooming when only 2 to 3 feet high.

The Twisted Heaths (*Erica cinerea*, with its varieties) start to flower right



McFarland photo

Twisted Heath (*Erica cinerea*)

after the Tree Heaths. They have rosy purple to pink or fuchsia-red blossoms. They are very drought-resistant when well established. *Erica cinerea* var. *atrorubens* and "Mrs. C. D. Eason" are two of the most colorful, while *Erica cinerea* var. *alba* is a very charming and cool-looking one.

Of the types with golden foliage *Erica cinerea* "Golden Drop" is one of the most colorful. During fall and winter its deep gold changes to russet and bright red, and its low wide cushion-like growth is most appealing. The flowers, which appear in late summer, are pinkish. *Erica cinerea* "Golden Hue" is about 18 inches tall, with its tapering stems clothed in bright golden foliage that turns a warm bronze in winter. This is a much admired plant in the garden.

Most of the Heaths start to bloom early in June. One of the unusual ones at this season is the Fringed Heath, or "Dorset Heath" (*Erica ciliaris*), which has pink, pitcher-shaped blossoms about $\frac{1}{2}$ inch long in clusters at the ends of the branches. *Erica ciliaris* var. *alba* and "Wych" are particularly good.

At this same time the Cross-leaved Heaths (*Erica Tetralix*) begin to show color. These have downy gray foliage which is most delightful when the plants are not in bloom; and their clusters of waxy pink or white blossoms are indeed charming in their profusion over a long period. *Erica Tetralix mollis* (with white flowers) and *Erica Tetralix rubra* are two very fine forms that are compact in growth and very free-flowering.

The Corsican Heath (*Erica stricta*) grows to at least 4 feet, but may be pruned for a low hedge plant to good effect. Left to grow normally, it makes a wide-spreading loose-grown shrub with attractive pink blossoms in summer. The dried flower heads in fall or winter are not unattractive on the plant. When cut and used with cones and broad-leaved or coniferous evergreens, they can be delightful material for indoor decorations at a season when blossoms are at a premium.

If one is attempting to produce all-year color with Heaths, the varieties of the Cornish Heath (*Erica vagans*) will prove of particular value. They are so very prolific as to flower, and so charming as to color, that they must be included in any planting of good varieties. "Mrs. D. F. Maxwell" has deep cerise flowers. "St. Keverne" is an all-time favorite in pure pink, while "Lyonesse" is a fine milk-white. *Erica vagans nana* is a good white form, considerably more dwarf than the preceding. It is useful as a low formal border for Rose beds, where its profusion of white blossoms is most effective, and its close green foliage is good all through the season. It is an attractive rock garden subject. All of the *Erica vagans* types are particularly free-flowering and effective in any planting scheme.

Heathers

At the same time as the Cornish Heaths are in flower, the horde of Heathers come into the garden picture. There are some sixty varieties available on the Pacific coast. Many are somewhat similar, but the various types show a wide diversity of

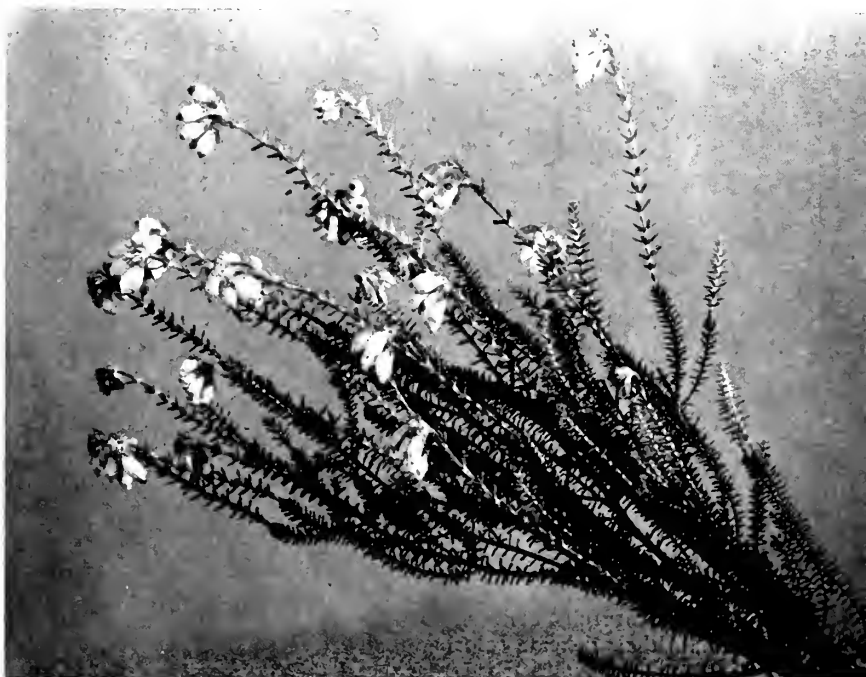
uses. They may be had from the prostrate "Mrs. R. H. Gray," 3 inches tall, whose foliage is beautifully sprinkled with lavender bloom in July, to the 3-foot "Johnson's variety," with its glorious spikes of lavender bloom from October through November. *Calluna vulgaris alba plena* is a charming double white form. *Hammondii* has tall graceful white spires and bright green winter foliage. "Camla" is low, with a spreading habit and charming, double, soft pink flowers. "County Wicklaw" has ferny light green foliage and lovely soft shell-pink blossoms in fine spikes. *Foxii nana* is the tiniest of the tiny; a minute mat or cushion of bright green "moss"; this is a real jewel for the rock garden. "J. H. Hamilton" is rather prostrate, with lovely vivid double rose-pink blossoms. "Minima Smith's variety" has thick dark green foliage that turns bronzy in winter. "Tib" is one of the newer sorts that has particular merit. It starts to bloom in early June and is still in good color in



McFarland photo

Cornish Heath (*Erica vagans*) "Mrs. D. F. Maxwell"

Cross-leaved
Heath (*Erica*
Tetralix)



Irish-Heaths

The Irish Heaths, or "Irish Bell Heathers" (*Daboecia*), may perhaps be a bit on the tender side, but their long season of profuse bloom should recommend them for at least a trial in the colder climates. The leaves are larger than in most of the other Heathers; they are smooth and shiny and deep green. The blossoms, which are rather large, are drooping and vase-shaped, and are borne in airy clusters; they are produced from midsummer to late fall. The plants will not exceed 16 inches in height, but will grow somewhat wider when mature. The type, *Daboecia cantabrica (polifolia)*, has lavender-pink satiny flowers, and is most charming. There is also a pink form (*Daboecia cantabrica pallida*, or var. *rosca*), that is somewhat smaller; and var. *alba* is a lovely waxy white. *Daboecia cantabrica bicolor*, or var. *versicolor*, is a real curiosity, for it has white, striped, and lavender blossoms all on the same plant. It is a quaint oddity, that is perhaps more curious than beautiful; but for those who collect unusual plants it may prove of considerable interest.

Tender Kinds

No attempt has been made to seduce the prospective grower into trying the difficult or particularly tender sorts; but the above notes will perhaps open the eyes of the inexperienced Heather enthusiast to the possibilities ahead. The South African sorts, which in most cases require greenhouse care, are not for the average gardener. *Erica arborea* var. *alpina*, which is very lovely in the Northwest for several years—until a hard winter comes along and takes it—is not for the eastern enthusiast. But there are many reliable and hardy sorts, which will endure the severe winters of New England and the east coast and could be more generally grown. Some of the hardier types at least should be tried, so that a wider enjoyment of garden color over a much longer season may be obtained.



McFarland photo

Heather (*Calluna vulgaris*)

October. It has long slender spikes of semidouble flowers in a bright fuchsia-purple. It is showy and long-lasting, and is a truly desirable sort. "Mrs. H. E. Beall" is one of the finest of the double Heathers, with lovely soft pink flowers in long spikes that are well suited to cutting. If cut when not quite mature, these can be carefully dried in shade and will retain their delicate coloring.

ABBOTT'S PIGMY HEMLOCK

Tsuga canadensis var. *minuta*
Teuscher *

Henry Teuscher

THIS smallest of the Hemlock dwarfs is of particular interest because it is one of the few dwarf conifers which are known to come absolutely true from seed. What is more, it is the only one, to my knowledge, which has never been propagated vegetatively, either from cuttings or by grafting. The extremely short annual growth—about $\frac{3}{16}$ inch—has defied all such efforts.

The Pigmy Hemlock was discovered in 1927 by Mr. Frank L. Abbott, in an out-of-the-way part of the Green Mountains (from which the State of Vermont derives its name). What Mr. Abbott found there must have been a very old plant, although it was less than 2 feet tall and about as much in diameter. The fact that it held some old cones on its tiny branchlets was of particular interest. Because of the nature of the locality, it was impossible even to consider digging up the old plant, and so it was left undisturbed; but it is supposed to have been destroyed since.

The discoverer was very secretive about his find and never divulged its exact whereabouts. Neither could he be prevailed upon to make a trip there in the fall in order to gather seeds. He explained that the place was very difficult to reach, and that only in the spring was it possible to locate the plant—after the snow of the winter had matted down the leaves, and before the tall ferns (which abound there) commenced to grow. However, he went back several times in spring, over a period of eight or ten years, and gathered, all together, some twenty-five seedlings which he found near the mother



Photo courtesy Montreal Botanical Garden

plant. These are all equally dwarf, and show scarcely any variation.

Because these seedling plants are the only specimens of this variety in cultivation, Abbott's Pigmy Hemlock occupies a rather unique place among the dwarf conifers. All the others are clones, being propagated only vegetatively from one original plant. This one has been propagated only sexually (from seeds), and therefore it is definitely entitled to a Latin varietal name as a mutant of proved stability. I gave it the name *Tsuga canadensis* var. *minuta* (in *The New Flora and Silva*, 1935, page 274).

The plant shown in the accompanying picture was received at the Montreal Botanical Garden in 1942 from Mr. George L. Ehrle, who obtained it from Mr. Abbott. It must be at least 15 years old, but it is only slightly over 3 inches tall. However, its confinement in a pot has undoubtedly caused the plant to develop even more slowly than it would under normal conditions in the open ground. Another seedling of the same mother plant, which has been growing in the open at the Hemlock Arboretum "Far Country" since 1938 and can be no more than a few years older than our plant, is $7\frac{1}{2}$ inches tall, with a spread of about 8 inches. This specimen is described and illustrated in *Bulletin No. 62 of The Hemlock Arboretum at "Far Country,"* April 1, 1948.

* See footnote on page 164.

DWARF CALIFORNIAN SHRUBS

Good for ground covers

Maunsell Van Rensselaer

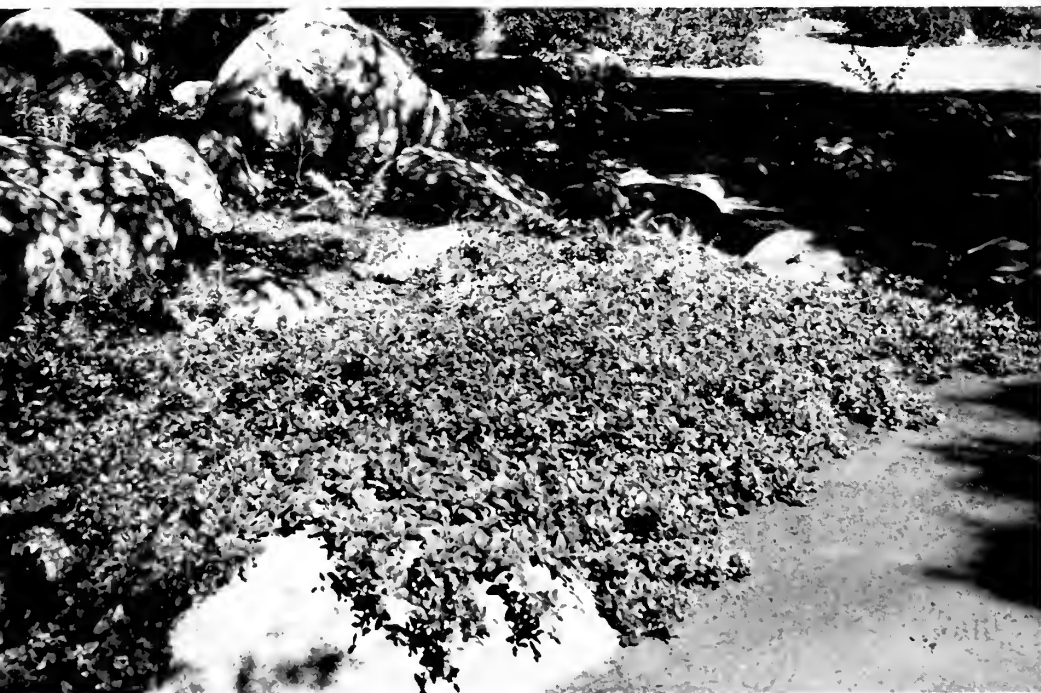
A DWARF shrub is one that is smaller than others of its kind; or it may simply be stunted in form. Many low-growing shrubs, woody cushion plants, subshrubs, and procumbent* shrubs—of special value in California as ground covers—are frequently referred to as dwarfs. Needless to say, viewpoints may differ as to the term best suited for a description of the habit of a particular species.

* See explanation on page 191.

In California, the two native groups which probably furnish the largest number of attractive shrubs of horticultural promise are *Ceanothus* and *Manzanita* (*Arctostaphylos*). Of these two genera, several evergreen species and varieties are dwarfish or prostrate in character.

Ceanothus

Among the most popular of the small Ceanothuses are Carmel Creeper (*Ceanothus griseus* var. *horizontalis*) and Point Reyes Creeper (*Ceanothus gloriosus*). Carmel Creeper occurs on the wind-swept bluffs above the sea at Yankee Point in Monterey County, south of San Francisco.



Josef Muench photo, courtesy Santa Barbara Botanic Garden

Carmel Creeper (*Ceanothus griseus* var. *horizontalis*)

Under cultivation, it develops into a broad, low-growing shrub, sometimes 6 to 8 feet or more in diameter, but not over 12 to 18 inches tall, with the outer branches flush with the ground. The dark green leaves are 1 to 2 inches long; and the profuse flower clusters are from 1 to 3 inches long, varying in color from light to deep blue. Closely related to Carmel Creeper and similar in many respects, though not so well known in cultivation, is Creeping Blue-blossom (*Ceanothus thyrsiflorus* var. *repens*).

Point Reyes Creeper occurs along the coast in a small narrow strip north of San Francisco. The form in cultivation is a prostrate shrub only a few inches tall, usually forming a mat several feet broad. The roundish, sharply toothed leaves are glossy green; and the fragrant lavender-blue flowers are abundantly produced in small short-stalked clusters.

Other prostrate or low, arching-branched Ceanothuses frequently cultivated in California are Vine Hill Ceanothus (*Ceanothus foliosus* var. *vincatus*); Mount Vision Ceanothus (*Ceanothus gloriosus* var. *porrectus*); Calistoga Ceanothus (*Ceanothus divergens*); and Mary Lake Ceanothus, thought to be a hybrid between *Ceanothus thyrsiflorus* var. *repens* and *Ceanothus griseus*. Others commonly grown and sometimes dwarfish in habit are *Ceanothus dentatus*, *foliosus*, *impresus*, *Masonii*, *rigidus*, *Roweanus*, and *verrucosus*.

Manzanita

Several of the creeping or low-growing Manzanitas are becoming popular in California gardens. One of the most satisfactory of these is the Hooker Manzanita (*Arctostaphylos Hookeri*), from the vicinity of Monterey Bay. Typical of most



Lester Rowntree photo, courtesy Santa Barbara Botanic Garden

Point Reyes Creeper (*Ceanothus gloriosus*)



Robert Skuster photo, courtesy Santa Barbara Botanic Garden

Hooker Manzanita (*Arctostaphylos Hookeri*)

Manzanitas, this one has smooth stems with dark reddish bark. Its bright green glossy leaves are less than an inch in length, and its tiny bell-shaped flowers have a pinkish tinge. The branches take root wherever they touch the ground. A 14-year-old plant in the Santa Barbara Botanic Garden is now 15 feet in diameter.

Closely related to Hooker Manzanita is Laurel Hill Manzanita (*Arctostaphylos franciscana*), a creeping plant apparently confined to a small area of the San Francisco peninsula. Plants of this in the garden of Louis L. Edmunds, in Danville, have formed mats 3 to 4 feet broad and only 6 or 8 inches high.

Perhaps the most beautiful of the dwarf Manzanitas when in bloom is Sonoma Manzanita (*Arctostaphylos densiflora*), a species which occurs in the Vine Hill region of Sonoma County. In general appearance it is similar to Hooker Man-

zanita, except that the tiny flowers are densely packed in larger clusters.

Sandmat Manzanita (*Arctostaphylos pumila*) is confined in its native habitat to the sandy flats and hills bordering Monterey Bay. Its soft, gray-green leaves are half an inch long; and its tiny flowers grow in little clusters. In the garden it requires a sandy soil, and usually grows as a mat or a very low shrub.

Bearberry (*Arctostaphylos Uva-ursi*) is probably more widely known throughout the Northern Hemisphere than any other Manzanita, yet it is only occasionally cultivated in California gardens. It occurs in variable forms on the Pacific Coast from northern California to Alaska. When these forms are brought into cultivation, they fail to produce the bright red fruits in the autumn which make the plant so handsome as an ornamental in other regions.

DWARF RHODODENDRONS AT SEATTLE

*For rock gardens, mass plantings,
and ground covers*

B. O. Mulligan

MOST people, when thinking about Rhododendrons, conjure up a mental picture of a large bushy shrub well covered by rounded trusses of pink, rose, or red flowers. But the genus is so vast and varied that it includes species of every shape and size from large trees to prostrate shrublets, amongst them some to suit almost any situation in gardens of the temperate zone. The dwarf species, up to perhaps 30 inches in height, have a value and attraction of their own—not in competition with their larger, showier brethren, although some may be associated with these—but especially for use in rock gardens, in open situations where a mass planting is required, or as ground covers for Lilies or other bulbs.

One of the best descriptions of these small shrubs in their native home in Asia is to be found in the pages of *Rhododendrons for Everyone*, by F. Kingdon-Ward: "In the comparatively dry and lofty mountains east of the Yangtze are hundreds of square miles of moorland, covered with tussocks and brooms and mats of dwarf Rhododendron. In May they appear as a chromatic storm-tossed surf—rose, pink, purple, lavender, and amber—through which one may wade ankle-deep for days on end." The author goes on to tell that the various groups or series of dwarf species are found in different areas—Lapponicum in west and northwest China, Anthopogon in the Himalayas, Saluenense and others in north Burma, Cephalanthum in northwest Yunnan, and so on. (Anthopogon and Cepha-

lanthum, however, are now united under the former name.)

Representatives of most of these series are now growing successfully in the University of Washington Arboretum at Seattle, generally planted in light sandy soil on banks facing north or west. Other than a mulch of sawdust or leaves they have received no particular attention since they were planted; and for the most part they flowered well this spring. Their peak blooming period is in April, although the Saluenense and Anthopogon series flower after the Lapponicum species and thus prolong the season. Some of the last often bear flowers again in September.

Lapponicum Series

Of the large Lapponicum series the following can be recommended. *Rhododendron impeditum* is one of the smallest, very compact and cushion-like, in height 9 to 12 inches. The violet flowers are in tight terminal clusters of three to four. This plant was found on the mountains of southwest China by George Forrest, and introduced by him. It is admirable for a rock garden, and very distinct in habit and character.

Rhododendron intricatum is somewhat larger, growing $1\frac{1}{2}$ to 2 feet tall, with very slender and wiry branches. The leaves are aromatic when rubbed, like many others of this series. The flowers are violet, in compact little trusses of six or more at the ends of the shoots. This plant was introduced by Ernest H. Wilson from western Szechuan, China, where he found it at 12,000 to 15,000 feet altitude.

Rhododendron hippophaeoides, one of the tallest of the Lapponicums, averaging about 3 feet, is upright in form, the old branches gray. It has violet flowers, about eight together in very compact



E. F. Marten photos, courtesy University of Washington Arboretum

Rhododendron deleense, one of the most attractive of all dwarfs

heads. It is another of George Forrest's introductions from southwest China.

Others worth cultivating are the early, rich purple *Rhododendron russatum*, the lavender-blue *Rhododendron scintillans*, violet-hued *Rhododendron lysolepis*, or for variation the pale yellow-flowered *Rhododendron chryseum* or *Rhododendron flavidum*.

Virgatum Series

One species in the small Virgatum series is an essential element in any west coast planting: *Rhododendron racemosum*, from Yunnan, southwest China, where it was originally found by Delavay in the later nineteenth century, but introduced to English gardens much later by Forrest. The small bushes, 1½ to 3 feet tall, are usually compact, although sometimes inclined to throw out long shoots which should be cut back with a knife. The flowers, in distinction from most Rhododendrons, are borne in the leaf axils along the shoots (not terminally), although they often form dense clusters. Their color is rose to pink. A compact form, of rich coloring, is that introduced by Forrest under his No. 19404.

Anthopogon Series

Species of the Anthopogon series are perhaps the least like the average person's conception of a Rhododendron, although those of Saluenense might run them close in this respect. Flowering bushes of the former, 1½ to 2 feet high, with their compact heads of flowers (usually white to pink, small, and rather tubular), have much of the appearance, though none of the fragrance of flower, of some species of *Daphne*. The leaves, however, are aromatic, like those of most of these dwarfs.

Species of merit in cultivation are: *Rhododendron cephalanthum*, from southwest China, Tibet, and Upper Burma, with its smaller, pinker variety *crebreflorum*; the low and spreading *Rhododendron Sargentianum*, found and introduced by E. H. Wilson, unusual with its lemon-

yellow flowers; and the taller *Rhododendron trichostomum* (*sphaeranthum*), and its varieties formerly regarded as species, *ledoides* and *radinum*, having white to pink clusters. These also hail from southwest China, but from an altitude of 11,000 feet or more.

Saluenense Series

In series Saluenense there are about a dozen species, natives of the mountainous area between western China and northern Burma. All are low-growing and compact little shrubs; some, like *Rhododendron prostratum*, *keleticum*, and *radicans*, almost or quite prostrate and spreading in habit. Such plants require rock garden conditions to be properly displayed, although they may be grown in an open bed provided soil conditions are suitable for them; good drainage and yet adequate humus both seem important.

One of our most attractive species is *Rhododendron calostrotum*, blooming in late April after many of the other small species are over. This is a compact and upright little bush of 12 to 20 inches, usually widest at the top. The orchid-purple spotted flowers, often in pairs, are held up conspicuously at the ends of the stems; in shape they are wide-spreading saucers up to 2 inches wide. This plant was first found by Kingdon-Ward in northeast Burma, later by Farrer, at 11,000 to 13,000 feet. Others of value in the same series are *Rhododendron chamacunum* and *saluenense*; the name of the latter is derived from the Salween River, which flows south from China through Burma.

Boothii Series

Somewhat larger than any of those already mentioned, but still amongst the lesser species in size, is *Rhododendron deleiense*, one of the most attractive of all because of the beauty of form and color of the very many nodding bell-shaped flowers of rose or pink, held up in loose terminal clusters. The bushes grow 2½ to 3 feet in height. This was one of Kingdon-Ward's



Rhododendron racemosum

discoveries in the Delei Valley, Assam, in 1928, growing on rocky ridges at 8,000 to 11,000 feet. It belongs to the Boothii series, of which several other representatives thrive in the Puget Sound area and down the west coast. Some of these are the March-flowering, cushion-forming *Rhododendron leucaspis*, with milky white flowers 2 inches in diameter; the taller, pink *Rhododendron tephrocephum* (with which *Rhododendron deleiense* is now considered to be synonymous); and the buff-yellow 3-foot-tall *Rhododendron auritum* from southeast Tibet. None of these, however, is likely to be as hardy as species of the other series described, although they did not suffer from last January's temperature of 10° F. in Seattle.*

* Rehder (in his *Manual of Cultivated Trees and Shrubs*) indicates climatic Zone VII as the limit for most of these plants, but it is probable that some will be found hardy

Trial should be made of as wide a selection as possible. All are easily raised from seeds or can be propagated by cuttings.

Many species of these and several other series have been omitted for considerations of space or other reasons; but the enthusiast can find them listed and described in *The Species of Rhododendron* (2nd edition), or *The Rhododendron Handbook* (1947). Both books are published by the Royal Horticultural Society, London, whose *Rhododendron Year-books* for 1947 and 1948 contain thorough revisions of the Anthopogon, Boothii, Glaucum, and Lepidotum series. These revisions are by Dr. J. M. Cowan and H. H. Davidian of the Royal Botanic Garden, Edinburgh, a fertile source of seeds for many plants now flourishing in Seattle.

at least in Zone VI, especially in more favored sites and under good growing conditions.

ARTIFICIALLY DWARFED TREES

How to succeed with them

William Penn Mott, Jr.

THE art of growing trees in shallow pots or pans, so that their growth and form are artificially controlled, is practiced quite successfully in this section of California. Many Japanese gardeners and nurserymen have fine collections of "Bonsai," and through their enthusiasm for this form of gardening, have created a considerable amount of interest in it among residents of the Bay area.

"Bonsai" is a Japanese word which in English might be defined as potted plants cultivated in shallow pans or pots so as to assume the smallest possible area.

For the most part, the tree is trained so that its natural habit and character of growth are accentuated by the training and cultural processes. The Japanese have perfected the art to such an extent that they far surpass any other race of people in ability to create artistic shapes of great beauty and interest.

Classification

Bonsai plants are classified according to their shape, there being two fundamental forms: the standing type, composed chiefly of a trunk or trunks standing upright; and the hanging or cascade type, in which the trunk or trunks are curved and bent low, generally below the level of the container. Each of these major classifications is divided into subclassifications, depending upon the character of the plant.

For example, in the upright or standing classification, a tree form in which the trunk is forked into either three or five stems is termed a "Bokan Bonsai." In these multiple-trunked forms the forks

are usually in odd numbers; and the closer the branching is to the root, the more valuable the tree is considered.

In the hanging types, the degree to which the tree is bent determines the sub-classification into which the tree is placed.

Pots

The color and shape of the pot or pan in which the tree is grown is of great concern to the Japanese artists. They believe that the shape of the pot should blend with the character of the tree, and they have certain conventional rules which guide them in the choice of a suitable pot. For example, evergreen trees of the Pine Family are usually planted in white or brownish-colored pots. Deciduous and broadleaf trees are often planted in white or brownish pots; however, gray or blue pots are frequently used for this type of tree. Trees with red flowers are planted in white pots, while those with white flowers are planted in reddish or maroon-colored pots.

In most cases the pots are formal and symmetrical in shape, and show a high standard of workmanship and exquisite color. Most of the pots are highly glazed. It is considered improper in the growing of Bonsai trees to use defective or stained pots and pans.

The cultivation and care of dwarf trees is a special art in itself. As the tree becomes older, its beauty and charm are enhanced, but the danger of death through improper cultivation is great.

Watering and Drainage

Watering is of prime importance. Since the trees are grown in small shallow pots that hold only a limited quantity of well-drained soil, it is essential that watering be regular; and the foliage should be



Harold Winder phot

Trident Maple (*Acer buergerianum*), over 150 years old, imported into the United States in 1913, height approximately 24 inches, now at the Toichi Domoto Nursery, Hayward, California

syringed at the time the plant is being irrigated.

Rapid drainage is another important factor in the proper growing of dwarf trees. A soil mixture that contains at least 50 per cent of fine granite sand or

sharp clean sand, and 50 per cent fertile, coarse-grained soil, is ideal. This soil mixture should not only drain well, but also retain sufficient moisture so that the plant is not retarded from active growth during the growing season.



Japanese Black Pine (*Pinus Thunbergii*), height 18 inches, age approximately 75 years, imported from Japan in 1913, now at the Toichi Domoto Nursery, Hayward, California. This particular plant should be thinned out to show more of the trunk and stem. Old needles should be carefully pulled off and thinned out

Transplanting and Repotting

Generally dwarf trees are repotted once a year. However, particularly in the case of deciduous flowering material, it is frequently necessary to repot them twice dur-

ing the year. It is of the greatest importance that the work be done at the proper season of the year. Each specimen must be treated separately according to its own particular growing habits. Trees 50 and 60 years old can be killed by



Dwarf Hinoki Cypress (*Chamaecyparis obtusa* var. *nana*), age 25 years, in the process of training. Present wiring has been developing form of tree for two years

being transplanted at the wrong time. When a Bonsai specimen is transplanted, the soil is carefully removed from around the roots. Care must be taken not to damage or injure the feeding root system. At each transplanting, the root structure of the plant is lightly pruned in relationship to the amount of top growth made during the growing season. The exact amount of root pruning to be done can be gauged only through years of experience.

Fertilization

The use of strong chemical fertilizers is not recommended for dwarf trees. Regular light feeding of cottonseed meal solution, or fish emulsion, is considered best. The quantity of fertilizer to be used varies with each specimen according to species, age, and size. Many people assume that dwarf trees have maintained their stature by starvation. This is not correct: the trees must be fed regularly in order to be kept in healthy growing condition. Generally, deciduous trees require more feeding during the season when they are in flower than do evergreen trees during their growing season. During the winter season fertilization is usually suspended.

Training and Shaping

The training and shaping of dwarf trees requires patience and skill. It is important to train the branches and trunk at the proper season of the year, when the branches are most pliable and can be bent without breaking. Attaining the proper curve to a single branch or trunk may require several years. Copper wire is generally used for training Bonsai trees, because when it is warm it is very pliable. The gauge or diameter of the wire should be as large as can conveniently be used on the branch or trunk to be trained. Usually the wire is preheated so that it can be bent and handled with ease. After the branch has been wrapped with the warm copper wire, ice-cold water is poured over it; this causes the wire to set and become

rigid. The wire should first be firmly fastened at its lowest end. The wire is then wound upwards, the spirals carefully made at even intervals. The exact spacing can best be determined by experience. The upper end of the wire should be firmly fastened, and the entire coil kept tight. The technique of applying the wire properly, so that it will remain firmly and securely fastened around the branch without coming loose when the branch is bent, is the secret of successfully training artistically formed dwarf trees. One can master the art only through experience.

Generally the training wire remains on the branch or trunk not longer than a year; then it is removed. If the branch or trunk has not attained the desired form, the wire is replaced and the process repeated until the desired curve has been attained. Frequently this requires several years. Great care must be exercised in removing the wire, as it is very easy to break or scar a branch during the process. Frequently on flowering trees with tender bark the training wire is first wrapped with soft, tough paper to prevent scarring the bark.

Varieties

The following list of trees includes those most commonly used in this country for Bonsai:

Japanese Red Pine (*Pinus densiflora*)
 Maidenhair-tree (*Ginkgo biloba*)
Zelkova serrata
 Japanese Maple (*Acer palmatum*)
 Japanese Black Pine (*Pinus Thunbergii*)
Juniperus chinensis
 Needle Juniper (*Juniperus rigida*)
 Trident Maple (*Acer Buergerianum*)
 Pomegranate (*Punica Granatum*)

In the training and cultivation of dwarf trees, patience is essential; but he who has this quality, and becomes interested in this ancient art of producing dwarf trees of great age and beauty, will find his efforts well repaid in the acquisition of a growing Bonsai.

OLD DWARFS IN LONG ISLAND GARDENS

Naturally slow-growing trees and shrubs

George S. Avery, Jr.*

RARE pictures, rare china, rare pewter, and rare clocks, all have their appeal. So do rare plants. Curiously enough, most of the dwarf trees and shrubs mentioned here are not rare as to kind, but they are very rare as to age. It is understandable that they should be found here, because Long Island was one of the early garden spots of America, an early center of ornamental horticulture. In fact, probably the first commercial nursery in the United States (as we understand the term) was in Flushing, now a bustling center of more than one hun-

* Readers who know of other old dwarfs, on Long Island or elsewhere, are invited to write to the author of this article.—Ed.

dred thousand people, in New York City's Borough of Queens. The nursery was founded in 1839 by Samuel B. Parsons and his brother Robert; and many of the specimens illustrated here undoubtedly came originally from their nursery. Samuel Parsons' great interest in Japan is probably responsible for the introduction of many dwarf plants such as Yew and the Japanese Maple.

Readers will wish to know how large dwarf trees and shrubs may become, and how much space will be needed for their full growth and development; whether they grow slowly in diameter as well as in height, and if they should be used only on small city lots—or whether they also have a place in plantings where there is ample room for extensive growth.

The old dwarfs in Long Island gardens answer these questions rather well. If one is thinking in terms of ten to forty or fifty years, dwarf trees and shrubs are



Sargent's weeping Hemlock (*Tsuga canadensis* var. *pendula*) at "Planting Fields"



Sargent's weeping Hemlock (at Cutting Arboretum) in front of upright Hemlock (*Tsuga canadensis*)



Dwarf White Pine (*Pinus Strobus* var. *nana*) in foreground, ordinary White Pine (*Pinus Strobus*) in background, at "Munnysunk" (see page 157)



Semidwarf form of White Pine (Cutting Arboretum). One of the many types that go under the name "var. *nana*" (see page 157)

the ideal choice for planting around the house and in borders, because their growth is slow and they stay easily under control without extensive pruning. But if one is thinking of the very long-term future, ample space should be available. Many of the dwarf forms will grow to a circumference of 80 to more than 100 feet—but it takes over a hundred years!

A word about the finding of the specimens mentioned here: I have known about some of them for several years, but am deeply indebted to Henry Hicks and J. J. Levison for leading me to the others. Mr. Hicks, at 85, is one of the outstanding senior plantsmen of Long Island; many of the dwarfs in this account were moved from their original locations by his father. And Mr. Levison's activities as an arboriculturist have brought a number of interesting old dwarfs to his attention.

Culture

Soil and growing conditions are not to be overlooked. All the soils in which the dwarfs are growing are somewhat acid, and range from a very light sandy loam to a good loam. Fertility is generally low, and little if any attention has been given to feeding; nor is there any record of watering, once the dwarfs became estab-

lished. Winter snows sometimes necessitate bracing certain limbs to prevent breakage, but apparently there has been no damage from wind. All the growing sites are away from the immediate seashore, and are thus somewhat protected. However, the age and successful growth of the plants are in no sense due to the relatively mild climate of Long Island: all are perfectly hardy, and could stand more rigorous winters.

Weeping Hemlock

Among the impressive dwarf trees of Long Island, W. R. Coe's two specimens of Sargent's weeping Hemlock (*Tsuga canadensis* var. *pendula*) are outstanding. They grow alone in a large expanse of lawn, and immediately catch the eye. The larger of the two specimens is 11 feet tall and 120 feet in circumference; its trunk just above ground level is 5 feet 2½ inches in circumference, and its three main branches range from 2 feet 9 inches to 4 feet 3 inches in circumference. One of the striking characteristics of the dwarf Hemlock is the flattened older branches. Mr. Coe's Superintendent, William G. Carter, says that he discovered the tree in 1929 on an old estate at College Point, Long Island. It was then in bad shape,



Dwarf Scots Pine (*Pinus sylvestris* var. *nana*), at "Munnysunk" (see page 158)

and the cost of the tree and moving it to its present site at "Planting Fields" came to \$750. It is about 100 years old, and probably came originally from the Parsons Nursery.

A half-dozen other fine old specimens of weeping Hemlock are to be found in the Bayard Cutting Arboretum at Oakdale, Long Island. They now range from 6½ to 10 feet in height and from 65 to 106 feet in circumference. It seems likely that all of them are from 75 to 100 years old, their size depending upon moisture and soil conditions at the different growing sites. In one case, a weeping Hemlock 8 feet high and nearly 100 feet in circumference is growing adjacent to the upright form of Hemlock. Their age is about the same. This is one of the best comparisons of tall growth and dwarf



Shrubby Japanese Yew (*Taxus cuspidata* var. *nana*), at the Clayton Pinetum. Secured from a small landowner in Flushing about 1923—then about half its present size (see page 159)

growth in a given species that were found on Long Island.

Pine

Not quite so impressive, but of real significance, and of greater horticultural interest year by year, is the 6-foot-high Dwarf White Pine (*Pinus Strobus* var. *nana*) at "Munnysunk," the home of Mr. and Mrs. Frank Bailey, at Locust Valley. It is 40 to 50 years old, and a full, close-growing, perfect specimen. It stands in front of several trees of the ordinary White Pine, planted about the same time, and now towering above it. This is the one place familiar to me, where dwarf and tall-growing varieties of White Pine can be seen side by side. (The largest Dwarf White Pine I have found thus far on Long Island is in the Cutting Arboretum



A form of Nikko Fir (*Abies homolepis*), just back and at left of figure, at "Munnysunk" (see page 159)



Dwarf Spruce (*Picea Gregoryana*) in front of Beech hedge, at Cutting Arboretum (see page 159)



English Yew (*Taxus baccata* var. *repandens*), Cutting Arboretum

at Oakdale. It is 16 feet high, and probably 75 to 80 years old.) Farther along the same path, at Mr. Bailey's, there is a specimen of the dwarf Scots Pine (*Pinus sylvestris* var. *nana*). It, too, is 40 to 50 years old, and a splendid specimen. No-

where else on Long Island have I seen this rare plant.

Yew

One of the oldest English Yews (*Taxus baccata*) on Long Island is a specimen of the variety *repandens* on the William Harkness Estate at Glen Cove. It is 10 feet in height and 125 feet in circumference. Adjacent trees that were once a generous distance away now encroach on it. Its trunk is much branched at ground level, but each of the three largest branches is approximately 10 inches in diameter. It is a specimen of considerable character, and should be in a more open setting to be fully appreciated. Those who choose to plant this particular Yew should give it ample space to grow, if they are thinking of the long-term future.

There are also two large specimens of *Taxus baccata* var. *repandens* in the Cutting Arboretum. One is 11 feet high and 112 feet in circumference; the other 12 feet in height and 96 feet in circumference. These specimens are at least 75 years old.



Weeping Japanese Pagoda-tree (*Sophora japonica* var. *pendula*), Harkness collection (see page 160)



Weeping White Mulberry (*Morus alba* var. *pendula*); roadway in Green-Wood Cemetery (see page 160)

The largest shrubby Japanese Yew (*Taxus cuspidata* var. *nana*) I have so far found is in the Clayton Pinetum at Roslyn; it is 6 feet high and 90 feet in circumference. Mr. Hicks says that it is very likely one of the first Yews imported from Japan by Parsons Nursery—probably about 1860.

Fir, Spruce, and Others

In Frank Bailey's collection at Locust Valley there is a dwarf Fir—a form of Nikko Fir (*Abies homolepis*)—that is extremely handsome. Mr. Bailey has planted it beside his driveway, where it catches the attention of everyone who is interested in plants. The specimen is about 40 to 50 years old.

There are several dwarf Spruces (*Picea Gregoryana*) at the Cutting Arboretum, growing in front of a Beech hedge. Some of the lower branches have rooted, so their appearance is unusual. They are at least 75 years old.

Of considerable charm is the very low-growing and compact Juniper (*Juniperus*

squamata var. *prostrata*) at Samuel A. Everitt's, in Huntington.

The only old dwarf (or at least slow-growing) broadleaf evergreen that was found was a specimen of Japanese Holly (*Ilex crenata* var. *convexa*). It is 6 feet high and 45 feet in circumference, and is located in the Clayton Pinetum.



Weeping White Mulberry in Pryible garden



Japanese Holly (*Ilex crenata* var. *convexa*), at the Clayton Pinetum. Presented by a Westbury friend about twelve years ago, then about a quarter its present size



Juniper (*Juniperus squamata* var. *prostrata*) in Samuel A. Everitt's garden (see page 159)

Deciduous Trees

The oldest dwarf deciduous trees found were weeping White Mulberries (*Morus alba* var. *pendula*) planted about forty years ago in a row along one of the walks in Brooklyn's Green-Wood Cemetery. Their age must be close to 60 years. Of similar age are the two weeping Japanese Pagoda-trees (*Sophora japonica* var. *pendula*) in Green-Wood Cemetery, and one in the Harkness collection. These specimens must be regarded as dwarfs, since they would trail over the ground if they had not been grafted high.

So much for some of the old dwarf trees and shrubs in Long Island gardens. They are few and far between—definitely something to be appreciated by those who are interested in rare and unusual horticultural specimens. And their age-size relationship is something for the prospective user of dwarf material to consider. As dwarf plantings grow older, there should be a systematic plan for removing certain specimens before they become crowded and their growth habit permanently spoiled.



Daphne Cneorum



*Juniperus
horizontalis*

Juniperus chinensis
var. *Pfitzeriana*







Salix purpurea var. nana

Teucrium Chamaedrys



FOUNDATION PLANTING

How to attain its real purpose

Henry Teuscher

THE theme of this issue of *Plants & Gardens* is dwarf or low-growing trees and shrubs, and it may seem that foundation planting does not actually belong in this field of discussion. It does, only in so far as plants which either do not grow higher than 3 or 4 feet or can easily be kept at that height are required for this phase of landscape gardening. A brief outline on foundation planting may therefore be appropriate.

Misconceptions

However, in order to provide a clear picture of the problems involved, it is necessary, first of all, to dispose of some of the prevailing misconceptions. Much has been written about the subject, and phrases such as "tying the house in with the surrounding landscape," or even "tying the house down to the ground," are used frequently in connection with foundation planting. This sort of explanation for such a type of planting has been a puzzle to me for the last twenty-seven years, ever since I first came to make my home in North America.

It appears that foundation planting is altogether an American invention, and is unknown in Europe. In such old gardening countries as England and France, people do not even know what we are talking about when this subject is mentioned. Actually, it is quite impossible to translate "foundation planting" into French, because there are no adequate words in this old language to convey exactly the same meaning. The reason is that in Europe a house is built for per-

manence, and the planting around it is arranged in such a manner as to set the house off to best advantage, not to hide parts of it. The real purpose of the foundation planting, however, is not "to tie the house down," but to hide an unfinished, ugly-looking foundation.

The Problem

We have to be frank about this, and look our problem straight in the face, if we want to obtain the best results. Let us bear in mind that we are dealing with an unfortunate necessity and an expedient, not with a virtue. It is undeniable, of course, that a great many houses are being built with unfinished concrete foundations for the sake of economy. Such houses will always be with us; and the landscape architect has the task of devising a suitable planting which will hide what is ugly, so as to improve the appearance of the property. This is the crux of the whole matter.

The fact that we have not been frank, but have coined all sorts of pretentious phrases instead of putting our finger on the sore spot, has had some very unfortunate consequences. In the first place, the foundation planting has been generally accepted as something every house requires, which it certainly is not. One result of this is that many architects advise their house-building clients that it is not worth while to spend money on a decent-looking foundation, because shrubs will be planted around the house anyhow. This is very sad.

A second result is that well-built houses, which would be worthy of individual treatment, receive as a matter of course a mosquito-hiding and otherwise undesirable fringe of evergreen shrubbery. This can verge on the criminal!

Examples

An excellent example is presented by the accompanying picture of an attractive, well-built house, which needed no foundation planting, but should have been framed by suitable trees and shrubs—while flowers, set out in front of it, would have given it additional charm. Not only were conifers planted against the house, but (as unfortunately so often is the case) the wrong kinds, which grow into trees, were chosen. Five years ago, when this picture was taken, the Arbor-vitae had completely obscured the windows of the first floor. By now they have grown beyond the second story, and the house inside is dark and dank. Even low-growing conifers, however, should not have been

planted, except possibly a very few well-chosen ones as accents and contrasts in a planting of flowers.

The second picture shows that there is a way out even with an inexpensive house, which does have a bare concrete foundation. This consists of a terrace, the slope of which may be planted with prostrate conifers, and bulbs and other flowers. In fact, a raised bed, supported by a dry wall, offers all kinds of attractive possibilities, and is no more costly than a conifer planting, which may have to be renewed every five or six years.

Selection of Plants

If we accept as the purpose of the foundation planting the hiding of the founda-



Author photos

A foundation planting of unsuitable varieties where no foundation planting was needed

tion, our problem becomes very clear. It consists in selecting shrubs and low-growing conifers of suitable height (their height depending upon the height of the foundation), which can tolerate the rather unfavorable conditions to which they will be exposed.

The conditions which we have to take into account include, in particular, the heat radiation from the house during winter: this is most serious from a high-built basement, and is especially harmful to conifers. The exposure is very important also, since its effects are greatly exaggerated against a house. The south side of a house, for instance, is much hotter than the south slope of a hill; while the north side of a house receives next to no

direct sunlight and even little indirect light.

The check list of dwarf or low-growing shrubs and conifers, given at the end of this issue, offers a wide choice of plants of suitable height, but a few may receive special mention.

Azaleas, such as the semi-evergreen *Rhododendron obtusum* and *yedoense*, are eminently suitable where climatic conditions permit their culture. The east side of the house is usually best suited for them. Certain varieties of Lilies may be planted between them for later flowering.

Floribunda Roses, with their long flowering period, should not be overlooked. They require full sun, and should be placed on the south side. Another excel-



A low terrace, planted with perennials, hiding the bare concrete foundation

lent shrub for the south side is Flowering Almond (*Prunus triloba flore pleno*). This is most successful growing on its own roots (not grafted), though plants raised from cuttings, unfortunately, are not often available. If the Flowering Almond is pruned annually, immediately after flowering, it can readily be kept almost indefinitely at a height of 3 or 4 feet.

Philadelphus virginialis Virginal, as well as various others of Lemoine's hybrid Mock-Oranges, can be treated similarly. If pruned sharply, almost to the ground, immediately after flowering, they will stay at a height of approximately 4 feet. To be sure, the side of the house will be bare for two or three weeks after pruning, but the shrubs will sprout up quickly after that, and the display of flowers is worth the sacrifice.

The Peegee Hydrangea (*Hydrangea paniculata* var. *grandiflora*) is even better than the last two, in so far as it has no bare period during the summer. It should be pruned in early spring; and through annual pruning it can be kept at various heights, 3, 4, or 5 feet as desired. Its flower display, towards the end of the season, is particularly welcome at that time. It thrives in partial shade, but will give perfectly satisfactory results on the west side of a house.

No conifer has been singled out for special recommendation. Actually, deciduous shrubs are much more satisfactory for foundation planting; and the greatly overdone planting of conifers in front of house after house (as is seen only too often) can result in deathly monotony.



A HANDSOME DWARF SPRUCE



New York Botanical Garden photo

Picea pungens var. *glauca* clone "R. H. Montgomery" Teuscher* in *Journal of The New York Botanical Garden*, May 1949.

This is a beautiful dwarf blue form of the Colorado Spruce—of very symmetrical shape. The original plant, shown in the photograph, is incorporated in the recently dedicated Montgomery collection of conifers of the New York Botanical Garden. It was named in honor of Col. R. H. Montgomery, who obtained the plant from the Eastern Nurseries, where it originated as a chance seedling. By incorporating this plant in his private conifer collection, Colonel Montgomery was instrumental in saving this exceptionally fine and desirable dwarf from extinction; it seems only fitting, therefore, that it should bear his name.

HENRY TEUSCHER

* In technical writings, the scientific name of a plant is always followed by the name of the person who gave the plant that name.

HOW TO PROPAGATE DWARF CONIFERS

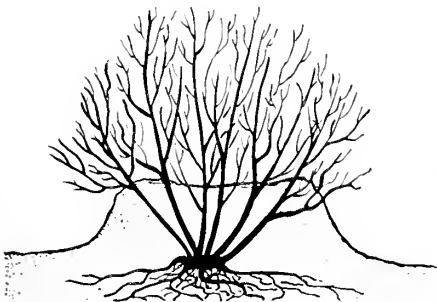
By layers or by cuttings

Richard H. Fillmore

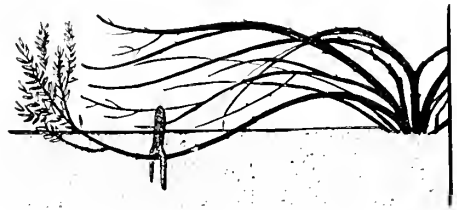
IF you are interested in growing dwarf conifers, don't try to grow them from seeds. Even if seeds are collected from very small plants at high altitudes, the most that you can expect is a slow-growing conifer rather than a true dwarf one. Many dwarf varieties never produce seeds, and vegetative propagation is the only possible means of reproducing them.

Layering

When reasonably large stock plants are available, layering is certainly the safest and best method of propagating many dwarf conifers. Layers which are made in early spring should be fairly well rooted a year later, but it is best to let them remain for two years. With prostrate or drooping forms, the branch to be layered should be inserted from 4 to 6 inches below the general soil level. If mound layers are used with erect specimens, the mounds should be slightly concave in order to hold water. Rooting will be hastened if layered plants are well watered during dry weather.



Mound layering of an erect specimen



Layering of a drooping form

Cuttings

Time. Cuttings can be made at any time from late summer to early spring. The succulent growth of late spring and early summer will usually fail to survive. Specific dates are recommended for some species. In the vicinity of New Haven, Connecticut, Norway Spruce (*Picea Abies*) is said to root best when collected in mid-December.

Age and position. With most kinds, 1-year twigs root more readily than older material. These may be cut near the base of the 1-year wood, or they may include a small portion of older material. Larger cuttings of easily rooted kinds may be desirable, since they will produce good-sized plants in a much shorter time. Lateral branches from lower limbs will root more readily than terminals, but such cuttings are very unsatisfactory from upright forms of Spruce (*Picea*), *Pseudotsuga*, and Fir (*Abies*). Cuttings of these plants should be carefully selected terminal shoots, since laterals will usually result in sprawling plants which may never assume a normally upright form.

Cutting and planting. Whenever supplies and facilities permit, cuttings of conifers should be collected in generous

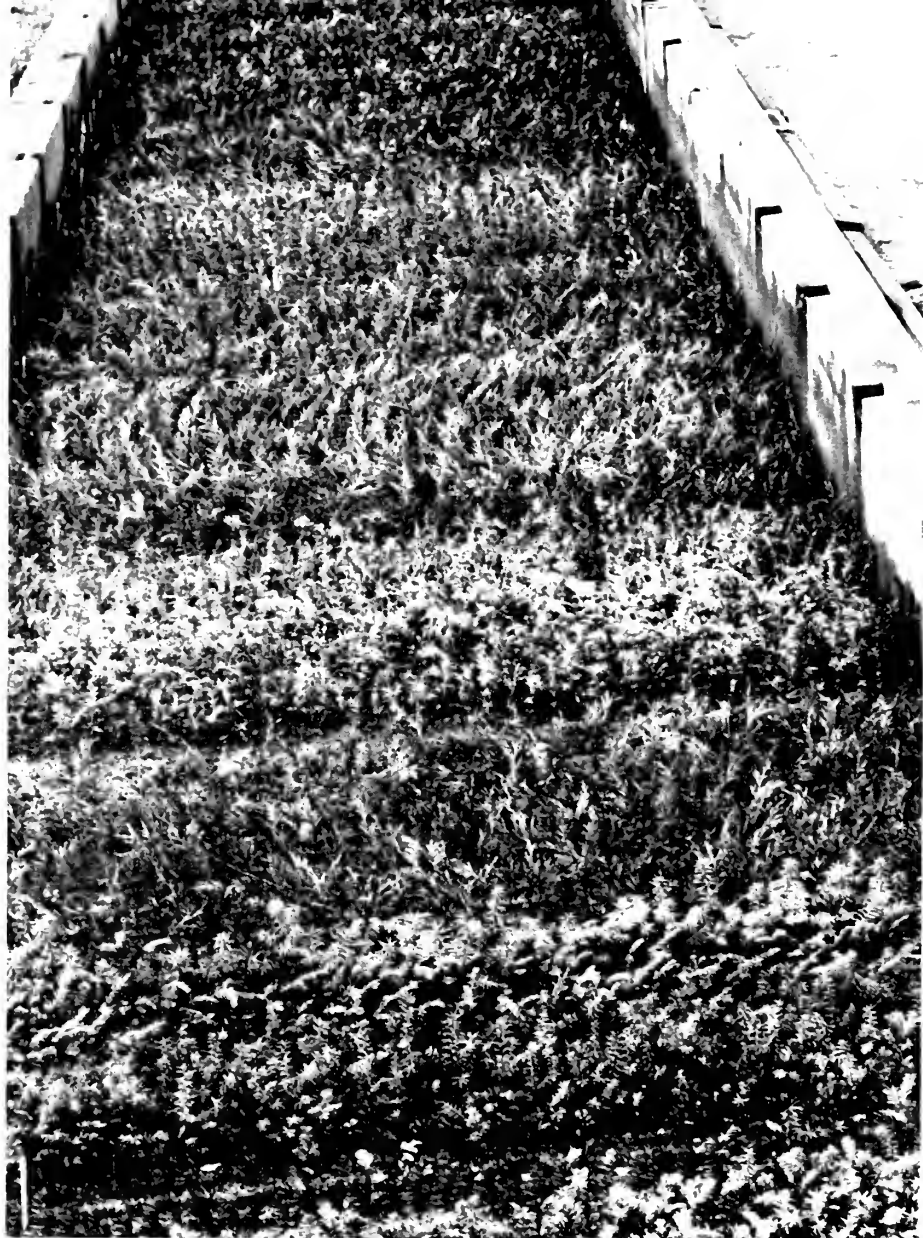


Photo courtesy Montreal Botanic Garden

Cold frame with conifer cuttings at the Montreal Botanical Garden. The cuttings were taken in October. For two months a soil temperature of 65–70° was maintained by means of electric heating cables. Then 1½ inches of dry leaves were packed between the rows of cuttings, Pine branches were placed over them for shade, and the frames were closed. Excellent rooting was obtained by spring

numbers. I always collect twice as many as I hope to root. Freshly cut conifers will usually exude a generous amount of resin. Contrary to popular opinion, this resin should not be removed. Winter collections are usually made during thaws. If it is necessary to collect frozen material, gradual thawing is probably desirable. In warm weather, cuttings should be kept moist, and planted as soon after collection as possible. Close planting and frequent light syringing will aid in maintaining the best conditions.

Conditions for rooting. Temperature, humidity, light, and the rooting medium are among the most important considerations in rooting cuttings. A temperature of approximately 70°, together with high relative humidity and reduced light, should furnish favorable conditions.

Sand and sand-peat mixtures are still standard for rooting conifers, although it is a matter of interest to experiment with other materials. While a greenhouse propagating bed or enclosed case is desirable, satisfactory results may be secured in cold frames. Bernard Donahue of Boston, whose hobby is growing dwarfs, has had good rooting in frames enclosed with coarse wire netting. A heavy layer of evergreen boughs gives added protection during winter. Cuttings planted from August through September are ready to transplant the following spring. Mr. Donahue has had good rooting of Yew (*Taxus*), Arbor-vitae (*Thuja*), and False-Cypress (*Chamaecyparis*), and some rooting of Pine (*Pinus*) and Spruce.

Special aids to rooting. Although root-inducing hormones must be used with care, they are of considerable value in the rooting of conifers. A proper dosage of indoleacetic acid or indolebutyric acid* will almost always result in quicker rooting and in a more vigorous and a better developed root system. A very minute

amount of the actual acid will often have a very beneficial effect. Overdosing will usually cause inhibition of roots, poorly developed shoots, or even dead cuttings.

A 2 per cent solution of ordinary cane sugar in water may be used either alone or following treatment with hormones. Sugar treatment alone is sometimes more effective than hormones, especially with cuttings of Pines. I know one nurseryman who has rooted low percentages of a selected dwarf, the Swiss Mountain Pine (*Pinus Mugo*), by the use of sugar alone. Numerous attempts with hormones over a period of several years, produced only one rooted cutting of this plant.

Grafting

The grafting technique has only a very limited application in the propagation of dwarf conifers. In a few years, the greater vigor of arborescent root stocks will cause the scion to lose its true dwarf character. In extreme cases the scion may completely revert to the tree-like habit. Deep planting following grafting may result in scion rooting, but even this procedure should be confined to new or rare varieties. The more vigorous growth of the grafted plant will soon provide an increased number of twigs. In most cases, these twigs should be used only as layers or cuttings for the propagation of own-rooted plants.

Conclusion

In the propagation of dwarf conifers, every effort should be made to obtain own-rooted plants. These may best be obtained by layering or by making cuttings. Cuttings of Yew, Arbor-vitae, and Juniper (*Juniperus*) are usually easy to root, while False-Cypress and Hemlock (*Tsuga*) are somewhat more difficult. Most propagators must content themselves with relatively poor rooting of Spruce and Pine. The proper use of hormones, sugars, and other special aids may ultimately place even these plants in the easily rooted group.

* Available commercially in Rootone, Hormodin, Quick-root, and Stimroot.

DWARF AND LOW-GROWING OR SLOW-GROWING PLANTS

*A more or less technical list for
reference*

John B. Nomer *

THIS list includes woody material that is dwarf in habit, although not all of the plants mentioned are dwarf varieties of species that are ordinarily large. Many of them are slow-growing or trailing in habit and therefore fit into the category of permanently small plants. It would be difficult, if not impossible, to make a complete list of dwarf material, because of the wide range in degree of dwarfism, the more or less loose use of the term "dwarf," the confusion that exists in the nomenclature, and the difficulty of collecting material. The plants listed here are in cultivation today and are hardy in the New York area. Doubtless some have been omitted, and readers are invited to write to the Brooklyn Botanic Garden with suggestions. The best-known of the books used in obtaining the names and descriptions of the plants are mentioned at the end of the list. The few technical terms used in describing the plants are explained on page 191.

Fir

Considering the large number of kinds of Firs, there are surprisingly few dwarfs; and most of them are not common in cultivation.

Abies alba* var. *compacta, DWARF SILVER FIR. A dwarf roundish evergreen shrub, broader than high, with crowded branches and very dark shiny leaves. It originated as a seedling in New York and is hardy below zero.

Abies alba* var. *tortuosa, DWARF SILVER FIR. A bushy dwarf, with crowded ascending branches and short lustrous bright green leaves. Hardy below zero.

Abies balsamea* var. *hudsonia, DWARF BALSAM FIR. A low, almost horizontally spreading form, with straight flat bright green leaves and slender branches. Native to eastern North America.

*The author expresses his thanks to Mr. Henry Teuscher, Editor of this issue of *Plants & Gardens*, for his freely extended help and advice, without which this list could not have been prepared.

Abies balsamea* var. *nana, DWARF BALSAM FIR. A dense subglobose plant, with short dark green leaves. Native to eastern North America, and hardy below zero.

Abies concolor* var. *conica, DWARF WHITE FIR. An attractive dwarf pyramidal form, with crowded horizontally spreading branches, and short grayish green leaves. Perfectly hardy, and (like *Abies concolor*) more tolerant of city conditions than other Firs.

Abies homolepis* var. *Scottiae, DWARF NIKKO FIR. A dwarf compact form which originated as a seedling in Pennsylvania.

Abies lasiocarpa* var. *compacta, DWARF ALPINE FIR. Densely branched conical dwarf, with stiff short branches and bluish green leaves.

Abies nobilis* var. *glauca prostrata, DWARF NOBLE FIR. A dwarf form, which grows very slowly and is broader than high. Somewhat less hardy than the previously mentioned Dwarf Firs.

Alyssum argenteum, YELLOW-TUFT. A dwarf dense woody subshrub to 15 inches high, with silvery leaves, and clustered golden yellow flowers in June and July. Native to Europe.

Alyssum pyrenaicum, MADWORT. A dwarf shrublet without spines. It has silvery gray leaves and white flowers.

Alyssum saxatile* var. *compactum, DWARF GOLDEN-TUFT. A compact spreading mat of gray-green foliage, woody at base, and topped with flat clusters of golden yellow flowers. It is easy to grow and hardy north, and requires full sunlight.

var. compactum flore-pleno. A double-flowered form.

Alyssum spinosum, MADWORT. A spiny little bush about 8 to 12 inches high, with narrow gray leaves. It produces a mass of showy white flowers in June and July and is perfectly hardy. Native to southern Europe.

Amelanchier stolonifera, DWARF JUNE-BERRY. Shrub to approximately 4 feet, spreading by underground runners. It has whitish-hairy young leaves and purplish edible fruits. Native to eastern North America.

Amorpha canescens, LEAD-PLANT. A densely white-hairy plant 3 to 4 feet high, with spikes of blue flowers 6 to 10 inches long, in July and August. Very hardy. Native to central North America.

Amorpha nana, FALSE-INDIGO. A dwarf shrub to 1 foot, with clusters of purplish flowers 4 to 5 inches long, in June. Very hardy.

Andromeda polifolia, BOG-ROSEMARY. A charming dwarf evergreen shrub, with long dark green leaves, and pale pink flowers in May and June. Native to bogs of northern North America.

Andromeda polifolia var. **montana**, BOG-ROSEMARY. A handsome form. The growth is more compact than in *Andromeda polifolia*, and the leaves are smaller and turn to a rich bronze in fall. It has pretty pink bell-like flowers in June and July. It is hardy, but requires an acid humus soil.

Arctostaphylos Uva-ursi, BEARBERRY. An excellent evergreen trailing shrub; small glossy green leaves, turning a pleasing bronze color in fall. White or pinkish bell-shaped flowers in May, followed by bright red berries in fall. It thrives best in acid sandy soil and full sun.

Arctostaphylos franciscana, **glandulosa**, **Hookeri** (illustrated on page 144), **media**, and **nummularia** with its var. **compacta**, are some of the Californian species, which are not hardy in the East.

Arctous alpinus, BLACK BEARBERRY. A deciduous horizontally spreading shrub, sometimes used as ground cover. It has finely toothed leaves, and white urn-shaped flowers tinged with pink. It requires an acid soil in partial shade.

Aronia melanocarpa, BLACK CHOKE-BERRY. A small deciduous shrub, 2 to 4 feet high, with shiny dark green leaves and white flowers, and attractive black berry-like fruits in fall.

Barberry

There are over a hundred kinds of Barberry, and about a dozen of them are distinctly dwarf in habit of growth.

Berberis buxifolia var. **nana**, MAGELLAN BARBERRY. A compact spiny evergreen shrub, 12 to 15 inches high, with orange-yellow flowers and dark purple berries. Native to Chile, and of uncertain hardiness north of New York.

var. **pygmaea**. A still lower form, with unarmed branches.

Berberis candidula, BARBERRY. An evergreen dwarf shrub, 15 to 24 inches high. The leaves are white beneath and have a few spiny teeth. Native to central China. Hardiness uncertain north of New York.



Photo courtesy John A. Grant

Bog-Rosemary (*Andromeda polifolia* var. *montana*)

Berberis Darwinii var. **depressa**, BARBERRY. A dwarf form, evergreen and spiny. Showy golden yellow flowers, glossy dark green leaves, and clusters of dark purple berries. Native to Chile. Rather tender.

var. **nana**. Another dwarf form. Equally tender.

Berberis empetrifolia, CROW BARBERRY. Evergreen, to 2 feet, with prostrate branches and spiny-pointed leaves. It has very handsome golden yellow flowers (like those of *Berberis Darwinii*) and is quite as tender. Native to Chile.

Berberis sibirica, BARBERRY. A deciduous spiny shrub to 2 feet tall. Spiny-toothed light green leaves, nodding yellow flowers, and red fruits. A native of Siberia; quite hardy, but rare in cultivation.

Berberis Thunbergii var. **atropurpurea** **nana**, JAPANESE BARBERRY. A beautiful deciduous shrub with bronzy red foliage. A very hardy and popular type. Native to Japan.

var. **compacta**. Slower-growing and more densely branched than *Berberis Thunbergii*, 3 to 4 feet high.

var. **minor**. A low-growing form, 1½ to 2 feet high, with simple spines and variable leaves. Used occasionally for very low hedges. Somewhat less hardy than *Berberis Thunbergii*.

var. **nana**. Another low-growing form.

Berberis verruculosa, WARTY BARBERRY. A dwarf evergreen compact shrub to 3 feet high. Yellow flowers; lustrous dark green leaves, bluish white beneath, and reddish when young. Native to western China, and not hardy below zero.

var. **compacta**. A dwarf and compact form.

Betula nana, DWARF BIRCH. A spreading branching deciduous shrub to 2 feet. Leaves

and branches sticky when young. Native to northern Europe and Alaska. It requires moist acid humus soil and is rather difficult in cultivation.

Bruckenthalia spiculifolia, SPIKE-HEATH. A dainty little shrublet from the Balkans, approximately 12 inches high, with heath-like foliage. Pink or white (var. *alba*) flowers in short spikes from June to early August. It is quite hardy and needs the same treatment as Heather.

Box

Boxwoods in general are slow-growing and compact, but the common ones eventually become rather large shrubs. Those listed here are extremely dwarf and are ideal for edging, for rockeries, and for knot gardens.

Buxus microphylla var. *compacta*, KINGSVILLE DWARF BOX. An extremely dwarf Boxwood, hardy to zero temperatures, and ideal for edging because it stays small. A 17-year-old plant is 12 inches high and 16 inches wide.

Buxus microphylla var. *koreana*, KOREAN BOX. A dwarf evergreen shrub, hardy below zero. It may be used in rock gardens or as edging material, for 20-year-old plants measure only 15 inches in height. Native to Korea.

Buxus sempervirens var. *myrtifolia*, DWARF EDGING BOX. A slow-growing Boxwood, with small dark green leaves. Suitable for edging, but less hardy than the Korean Box.

var. *rosmarinifolia*. Another low form with narrow, dark green leaves.

Buxus sempervirens var. *suffruticosa*, COMMON EDGING BOX. A dwarf and compact-growing form, which rarely grows more than 2 or 3 feet high, and has small oval glossy leaves. Much used for edging. Illustrated on page 132.

Heather

The Heathers are well known, and all are low-growing: the tallest ones grow little more than 3 feet high. Those that grow less than a foot tall are considered as the dwarfs of the group and are listed below.

Calluna vulgaris, HEATHER. The Heathers are dwarf shrubs of great value for the rock garden because of their neat and attractive evergreen foliage and their colorful flowers in July and August. They grow 2 to 3 feet tall, with short scale-like leaves, and mostly purple flowers in late summer. All varieties listed are equally hardy; and all require an acid, preferably sandy humus soil in full sun. Illustrated on page 140.

var. *aurea*. A very dwarf form with yellow foliage.

var. *compacta*. Of compact habit.

var. *Foxii*. Very dwarf and matted.

var. *humilis*. A low-growing form with white flowers.

var. *nana*. Perhaps the smallest of the group. It grows to 4 inches, with tight rounded tufts of moss-like foliage, and lavender-pink flowers in August and September.

var. *tenuis*. A slow-growing dwarf form with purple flowers.

Caragana pygmaea, DWARF PEA-TREE.

A deciduous spiny shrub to 3 feet high, sometimes more or less prostrate, with pinnate leaves, and pea-like yellow flowers in May and June. Native to northwestern China and Siberia. Very hardy.

Caryopteris incana var. *nana*, BLUE-BEARD OR BLUE-SPIREA. A deciduous dwarf shrub, 2 to 3 feet high, with opposite, toothed leaves, and clustered lavender-blue flowers in September and October. Native to China and Japan. Valued for its late flowers, but of uncertain hardiness even at New York. Since the rootstock survives with little protection, the plant is frequently treated as a perennial.

Caryopteris mongholica, BLUEBEARD. A deciduous shrub to 3 feet high; with opposite, toothed leaves, and lavender flowers in August and September. Native to Mongolia, and hardier than *Caryopteris incana*.

Cassiope, CASSIOPE. Low evergreen shrubs of the Heath Family, with scale-like leaves and small nodding flowers. They do well in moist, partially shady locations in peaty or sandy soil. They are difficult to grow in cultivation except where naturally suitable conditions prevail.

Cassiope fastigiata, CASSIOPE. A densely tufted shrub, 6 to 12 inches high, with white flowers. Himalayas.

Cassiope hypnoides, CASSIOPE. Prostrate shrublet, with red flowers. Circumpolar.

Cassiope lycopodioides, CASSIOPE. With arching stems; white flowers on red stems in July. Alaska and northeastern Asia.

Cassiope Mertensiana, CASSIOPE. To 1 foot, with white flowers. Western North America.

Cassiope Stelleriana, CASSIOPE. A spreading form with matted stems. Native from Alaska to Washington.

Cassiope tetragona, CASSIOPE. To 1 foot, with erect stems, and flowers an inch long. Circumpolar.

Cedrus libani var. *nana*, CEDAR OF LEBANON. Dwarf forms of Cedar of Lebanon are rather rare in cultivation, and most of them are grouped under this name (var. *nana*). They are usually roundish and compact bushes, rarely exceeding 3 or 4 feet.

Chaenomeles japonica var. *alpina*, a variety of the DWARF JAPANESE QUINCE. A semi-evergreen small shrub, with trailing stems and small leaves. Beautiful scarlet-orange flowers in clusters in March and April.

Chaenomeles lagenaria var. *nana*, a dwarf form of the JAPANESE QUINCE. An attractive ornamental semi-evergreen shrub, with thorny branches and shiny dark green leaves, and beautiful scarlet-red flowers in spring. Native to eastern Asia, and hardy below zero.

var. *pygmaea*. Another dwarf form, similar to var. *nana*.

Chamaecyparis

Some of the tiniest and most interesting of the dwarfs are found in this group.

Chamaecyparis lawsoniana var. *Forsteckensis*, DWARF LAWSON CYPRESS. Fan-shaped branches in dense whorls give the plant the appearance of a hedgehog. It eventually reaches a diameter of 2 feet or more.

Chamaecyparis lawsoniana var. *minima glauca*, DWARF LAWSON CYPRESS. A form of broadly conical shape, very dense in growth, dark steel-blue in color. The leaves are very small, with blunt tips close to the branchlets. It is common in cultivation; but (like all the varieties of *Chamaecyparis lawsoniana*) it is of uncertain hardiness north of New York.

Chamaecyparis lawsoniana var. *nana*, DWARF LAWSON CYPRESS. A very slow-growing globose or ovoid form, with its branches borne somewhat horizontally; dense and dark green.

Chamaecyparis lawsoniana var. *nana glauca*, DWARF LAWSON CYPRESS. A diminutive form, of slow growth, dense globose habit, and a bluish green color. Very pretty.

Chamaecyparis nootkatensis var. *compacta*, NOOTKA CYPRESS. A fairly slow-growing compact variety, forming an oval bush of very regular outline. Distinctly ornamental. Somewhat harder than other varieties of *Chamaecyparis nootkatensis*.

Chamaecyparis obtusa var. *compacta*, DWARF HINOKI CYPRESS. Broadly conical and compact, with very crowded branchlets on short branches.

Chamaecyparis obtusa var. *ericoides*, DWARF HINOKI CYPRESS. Subglobose in shape, with stout stiff branchlets and spreading leaves. Foliage bluish gray in summer, turning to plum color in winter. Not hardy below zero.

Chamaecyparis obtusa var. *lycopodioides*, DWARF HINOKI CYPRESS. A crowded, somewhat irregular pyramidal dwarf, with striking dark green foliage. Common in cultivation, and comparatively hardy.

Chamaecyparis obtusa var. *nana*, DWARF HINOKI CYPRESS. A low slow-growing spreading form, with short straight horizontal branches. It has very small dark leaves, almost black-green. One of the smallest of dwarf conifers. A 30-year-old plant measures only 6 inches by 8 inches. Illustration of trained specimen on page 152.

Chamaecyparis obtusa var. *pygmaea*, DWARF HINOKI CYPRESS. A dense round flat-topped bush, slow-growing. It has fan-shaped branches spreading almost horizontally close to the ground. Very old plants measure only 18 to 24 inches in height.

Chamaecyparis obtusa var. *tetragona*, DWARF HINOKI CYPRESS. Dwarf compact broadly pyramidal shrub, with more or less four-angled branches; crowded short branchlets partly yellow, partly green.

Chamaecyparis pisifera var. *filifera aurea*, DWARF SAWARA CYPRESS. Rather slow-growing, and forming a round low bush of vivid golden foliage when grown in full sun. Eventually, however, it will reach a height of 5 feet or more. Somewhat less hardy than the green varieties of *Chamaecyparis pisifera*.

Chamaecyparis pisifera var. *filifera nana*, DWARF SAWARA CYPRESS. A graceful bushy green form, very slow-growing. A specimen 25 years old measures only 2 feet by 3 feet.

Chamaecyparis pisifera var. *squarrosa dumosa*, DWARF SAWARA CYPRESS. Compact and slow-growing form, of extremely dense growth, to 3 feet or eventually 5 feet in height; more or less globular in shape, with a flattish top.

Chamaecyparis pisifera var. *squarrosa pygmaea* (minima), DWARF SAWARA CY-



Photo courtesy J. G. Bacher

Hinoki Cypress (*Chamaecyparis obtusa*), trained, semidwarf

PRESS. Very compact and slow-growing form to 2 feet in height, with very thin glaucous green leaves. Rather rare in cultivation.

Chamaedaphne calyculata var. **nana**, LEATHER-LEAF. An evergreen dwarf shrub to 1 foot, good for the rock garden. It does best in a moist acid soil of sand and peat. The white urn-shaped nodding flowers, produced in spring, are not very conspicuous. Var. *nana* originated in Europe. *Chamaedaphne calyculata* is circumpolar in distribution.

Cornus stolonifera var. **nana**, RED-OSIER DOGWOOD. Dwarf and compact shrub to 2½ feet, with thin dark red branches. Propagated by stooling and division. *Cornus stolonifera* is native to North America; var. *nana* originated in Europe. Very hardy.

Cotoneaster

Here are some Cotoneasters that are well adapted and often used for rockeries because of their low, spreading, or prostrate habit.

Cotoneaster adpressa, COTONEASTER. Deciduous prostrate shrub, which (like most Cotoneasters) grows best in a sunny position and a well-drained soil. Conspicuous bright red fruits in late summer and fall. Hardy below zero.

Cotoneaster buxifolia var. **vellaea**, COTONEASTER. A low densely branched evergreen shrub, more or less prostrate, with small leaves. Fruits red, but rather inconspicuous. Native to western China. Hardy down to zero.

Cotoneaster congesta, COTONEASTER. Compact evergreen shrub to about 3 feet. Leaves dull green, and smooth when mature. Native to the Himalayas. Hardy to zero.

Cotoneaster Dammeri, COTONEASTER. A prostrate evergreen shrub, with trailing and rooting branches. Leaves dark green and shiny above. Small red fruits mostly hidden, and not conspicuous. One of the very few Cotoneasters that tolerate partial shade. Useful as a ground cover. Native to Central China. Very hardy.

var. **radicans**. Smaller leaves, and 1 to 2 flowers together.

Cotoneaster horizontalis, COTONEASTER. A semi-evergreen shrub, with horizontally spreading branches and conspicuous bright red fruits. A very popular and very hardy species. Native to western China.

var. **minor**. A smaller form, with smaller flowers and berries.

var. **perpusilla**. More depressed in habit than *Cotoneaster horizontalis*, and with leaves smaller.

Cotoneaster microphylla, ROCK COTONEASTER. Evergreen shrub to 3 feet, with spreading branches and dark shiny leaves. Fruits scarlet and conspicuous. Very attractive species, native to the Himalayas and hardy below zero.

var. **minor**. A smaller form, of horticultural origin.

var. **thymifolia**. Narrower leaves on thin compact branches; flowers in clusters of two to four. About 12 inches high.

Cryptomeria japonica var. **nana**, DWARF CRYPTOMERIA. Dwarf and compact. Usually more or less semiglobose in shape, with short stiff bluish green needles. Hardy at Washington and somewhat northward. *Cryptomeria japonica* is native to Japan.

Cryptomeria japonica var. **Vilmoriniana**, DWARF CRYPTOMERIA. A very dwarf form, compact and upright, with bluish green needles. Very attractive, and useful for rock gardens. Hardiness the same as var. *nana*.

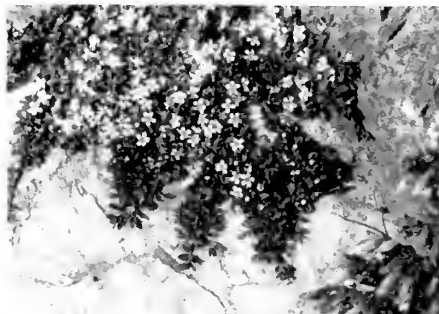


Photo courtesy John A. Grant

Cotoneaster (*Cotoneaster congesta*)

Broom

Most of the Brooms are useful for planting in shrubbery borders. The following free-flowering kinds are particularly low in stature.

Cytisus acutangulus, BROOM. A small deciduous shrub to 6 inches, with many stiff sharp-angled branches; small white flowers before the leaves. Native to Asia Minor, and not hardy below zero. Rather rare in cultivation.

Cytisus albus, BROOM. A spreading shrub to 1 foot, with white or yellowish flowers in terminal heads in summer. Native to southern Europe, and hardy somewhat below zero.

Cytisus Ardoinii, BROOM. Low, almost prostrate shrub, growing not more than a foot high. Flowers golden yellow and very attractive. Native to southeastern France. Able to withstand only light frost.

Cytisus Beanii, BROOM. Hybrid between *Cytisus Ardoinii* and *purgans*, semiprostrate, to 16 inches high. Flowers deep golden yellow. Hardy somewhat below zero.

Cytisus decumbens, BROOM. Prostrate shrub to 8 inches; bright yellow flowers axillary along the branches. Native to southern Europe. Hardy somewhat below zero.

Cytisus kewensis, BROOM. Hybrid between *Cytisus Ardoinii* and *multiflorus*. Procumbent, to 1 foot high, with creamy white or pale yellow flowers on slender branches. Hardiness the same as *Cytisus Beanii*.

Cytisus purgans, BROOM. Densely branched shrub to 3 feet. Stiffly upright, with yellow fragrant flowers and simple leaves. Native to southern Europe. Hardy to zero and somewhat below.

Cytisus purpureus, BROOM. Handsome procumbent shrub with ascending branches. Approximately 2 feet high. Flowers purple, sometimes white or pink. Native to southern Europe, and hardly somewhat below zero.

Daboecia cantabrica, IRISH-HEATH. A charming low-growing evergreen shrub; shiny dark green leaves on erect branches 8 inches high, topped with long spikes of large bell-shaped flowers, purple, white, or pink, from June to October. It must have acid, peaty soil and is not hardy below zero. Native to Ireland and Spain.

var. *nana*. Dwarf, with smaller leaves.

Daphne

The Garland-flower is undoubtedly the most familiar of the low-growing Daphnes. The others described here are much less known.

Daphne alpina, DAPHNE. A low deciduous shrub, to 1½ feet, with simple leaves, and fragrant white flowers in terminal clusters. Hardy below zero. Native to the European Alps.

Daphne arbuscula, DAPHNE. A low evergreen shrub to 6 inches, with fragrant rose-colored flowers in terminal clusters in June. Native to Hungary. Hardy to about zero. It differs from *Daphne petraea* in having redder branchlets.

Daphne Blagayana, DAPHNE. A small evergreen shrub to 1 foot, with white or yellowish fragrant flowers in terminal clusters in early spring. Native to the mountains of southeastern Europe, and hardy in the North.

Daphne Burkwoodii, DAPHNE. Hybrid between *Daphne Cneorum* and *caucasica*. Semi-evergreen, to 2 feet in height. Flow-

ers white, flushed pink, fragrant, in early spring. Hardy below zero.

Daphne Cneorum, GARLAND-FLOWER. A procumbent evergreen shrub, native to the mountains of central and southern Europe. About 12 inches high, with small dark green leaves, and clusters of rosy red, very fragrant flowers in April or May. Very hardy. See illustration in color.

Daphne Genkwa, DAPHNE. A deciduous shrub to 2 or 3 feet high, with slender branches. The lilac flowers, produced in clusters along the branches, appear in early spring before the leaves. Native to China and Korea. Not hardy below zero.

Daphne Mezereum, DAPHNE. An erect deciduous shrub to 3 feet, with stout branches. Lilac-purple or sometimes white fragrant flowers in early spring before the leaves. Native to Europe and Asia. Very hardy.

Daphne petraea, DAPHNE. A much-branched evergreen shrub to 6 or 8 inches in height. Flowers in terminal clusters in June, rose-colored and very fragrant. Very desirable rock garden plant, and perfectly hardy. Native to the Tirolean Alps.

Daphne striata, DAPHNE. A dwarf evergreen shrub to 9 inches in height. Closely related to *Daphne Cneorum*. Flowers rosy pink, in 8- to 12-flowered heads. Native to the European Alps. Hardy.

Deutzia Lemoinei var. *compacta*, DEUTZIA. A very dwarf and compact form of the hybrid *Deutzia Lemoinei* with pure white flowers. Attractive and floriferous shrub. Flowers in early summer. Hardy to somewhat below zero.



Photo courtesy J. G. Bacher
Daphne (Daphne arbuscula)

Dryas octopetala, MOUNTAIN AVENS. Evergreen creeping plant, belonging to the Rose Family; woody at base, with white showy flowers. Native to North America, Europe, and Asia. Very hardy, and suitable for rock gardens.

var. **integrifolia** (or *Dryas integrifolia*). With somewhat smaller white flowers. Native to northern Europe and arctic America.

var. **minor**. A very dwarf form.

Dryas Drummondii, DRYAS. With yellowish nodding flowers. Native to northeastern North America.

Elaeagnus pungens var. **nana**, ELAEAGNUS. A spiny dwarf evergreen shrub, with silvery green leaves dotted with brown scales. Small silvery white flowers in autumn, very fragrant. Native to Japan. It will stand only very light frost.

Empetrum nigrum, CROWBERRY. Spreading, prostrate, evergreen shrub to 10 inches high, with heath-like leaves and small black fruits. Native to northern Europe, northern Asia, and North America. Very hardy, but requires an acid sandy soil.

var. **purpureum**. With purple fruits. Native to eastern Canada.

Heath

Everyone should know the dwarf Heaths because they are practically indispensable in the rock garden.

Erica carnea, SPRING HEATH. Hardy evergreen dwarf shrub to 10 or 12 inches, with needle-like leaves usually in whorls, and red, white, or purplish flowers in early spring. It tolerates neutral or slightly alkaline soil. Native to Europe.

var. **alba**. White flowers.

var. **coccinea**. Bright red flowers.

var. **gracilis**. A slender form.

var. **Vivellii**. Light carmine red flowers.

Erica ciliaris, FRINGED HEATH. Semi-prostrate shrub, usually about 1 foot high, with rosy red, white, or purple flowers, and leaves fringed with hairs along the margin. Native to western Europe, naturalized in Massachusetts. Like most Heaths, it requires a moist, acid humus soil. Hardy.

Erica darleyensis, HEATH. Hybrid between *Erica carnea* and *mediterranea*; 15 to 24 inches high, with dark green foliage, and lavender-red flowers in spring. Hardy to about zero. Illustrated on page 137.

Erica mediterranea var. **nana**, HEATH. A low-growing form, with deep red flowers in spring. *Erica mediterranea* is native to southern Europe and Ireland. Less hardy than *Erica darleyensis*.

Erica vagans, CORNISH HEATH. A very bushy and upright-growing species, about 1 to 1½ feet high, with a profusion of purplish

pink, white, or red flowers in late summer or fall. Native to western Europe. Hardy. Illustrated on page 139.

var. **alba**. White flowers.

var. **aurea**. Yellow foliage.

var. **grandiflora**. Large flowers.

var. **rosea**. Rose flowers.

var. **rubra**. Deeper red flowers.

Euonymus

The different kinds of Euonymus vary considerably in habit of growth and can be used in many ways for ornament. The dwarf ones are no exception, for some are creeping and some are upright shrubs. Some are deciduous, while others are evergreen.

Euonymus alata var. **compacta**, WINGED SPINDLE-TREE. A dwarf densely branched, deciduous shrub, with corky wings on its branches. Very attractive in fall with its brilliantly colored foliage. *Euonymus alata* is native to northeastern Asia. Very hardy.

Euonymus europaea var. **nana**, EUROPEAN SPINDLE-TREE. *Euonymus europaea* is deciduous and has bright red or pink fruits; it is native to Europe and western Asia. Var. **nana** is a dwarf, dense but upright horticultural form; very hardy, but subject to scale.

Euonymus Fortunei var. **minima**, CREEPING EUONYMUS. A sterile creeping form, with long trailing branches and small dark green leaves. Hardy as far north as Massachusetts. The variety **minima** originated in France.

Euonymus Fortunei var. **radicans**, EUONYMUS. An evergreen trailing or climbing shrub, with small sharply toothed leaves. *Euonymus Fortunei* is native to China; var. **radicans** to Japan and Korea. Quite hardy. Illustrated on page 134.

Euonymus japonica var. **compacta variegata**, EUONYMUS. A low dense form, with variegated leaves. *Euonymus japonica* is evergreen, but is much less hardy than *Euonymus Fortunei*.

Euonymus nana, DWARF EUONYMUS. A usually procumbent deciduous shrub, with branches ascending to 2 or 3 feet. Leaves very narrow, dark green. Useful for covering rocky slopes. Native to the Caucasus and western China. Very hardy.

Euonymus obovata, RUNNING STRAWBERRY-BUSH. A deciduous procumbent shrub, with rooting stems, and ascending branches to 1 foot high. The crimson, warty fruits are very conspicuous in fall. Useful as ground cover. Native to eastern North America. Very hardy.

Forsythia "Arnold Dwarf," DWARF FORSYTHIA. This is a hybrid form, a small dwarf shrub that should be of value as a border plant. It was introduced by the Arnold Arboretum, where the original plant is about 2 feet tall, with a spread of 7 feet. The leaves are small, about an inch long. Unfortunately the plant is not known to flower. It would make a good ground cover, because the branches root as they grow along the ground.

Forsythia intermedia var. *nana*, FORSYTHIA. A low-growing hybrid form, with arching or spreading branches. It has showy yellow flowers and is hardy north.

Forsythia viridissima var. *bronxensis*, DWARF FORSYTHIA. A charming low-growing new introduction from the New York Botanical Garden. It rarely grows more than 2 feet tall. It blooms freely, and its flowers are showy for the size of the plant.

Fothergilla Gardenii, FOTHERGILLA. A small deciduous North American shrub to 3 feet, with white flowers borne in dense terminal heads or spikes before the leaves. It is hardy north and thrives in moist acid soils. The other two species of this genus are even handsomer but are more than twice as tall.

Fraxinus excelsior var. *nana*, DWARF EUROPEAN ASH. A compact and globular, very slow-growing form, with very small leaves. Sometimes grafted high. *Fraxinus excelsior* is native to Europe and perfectly hardy.

Gaultheria antipoda var. *adpressa*, GAULTHERIA. A procumbent evergreen little shrub of the Heath Family, adapted to rock gardens. It has white or pink fragrant flowers in spring, followed by large berries in fall. Native to New Zealand and Tasmania. Rather tender. Like all the Gaultherias, it requires a moist, acid, sandy humus soil.

Gaultheria humifusa, GAULTHERIA. A cushion-forming evergreen shrub to 4 inches, with fairly showy white flowers in July and bright scarlet fruits in fall. Native from British Columbia to California. Hardy to somewhat below zero.

Gaultheria Miqueliana, GAULTHERIA. Evergreen little shrub to 1 foot, with white or pinkish nodding flowers in spring and white fruits in fall. Native to Japan. Hardy to zero.

Gaultheria ovatifolia, GAULTHERIA. A small evergreen shrub to 8 inches, with thickish leaves, white showy flowers in June and July, and bright scarlet fruits in fall. Native to western North America, and quite hardy.

Gaultheria procumbens, WINTERGREEN, CREEKERRBERRY, TEABERRY. Another evergreen, native to eastern North America. Excellent for ground cover in sun or shade where an acid, sandy humus soil can be provided. It has dark green leaves that turn a reddish bronze in fall, showy white flowers in May and June, and very large brilliant scarlet berries in fall and winter.

There are several other Asiatic species, but these are rare in cultivation.

Gaylussacia brachycera, BOX HUCKLEBERRY. A beautiful evergreen shrub about 15 inches high; small dark glossy leaves, turning a rich bronze in fall. White bell-shaped flowers in spring, followed by large blue berries in fall. Native to the central United States. Hardy to zero. It needs a fairly rich moist woodland soil in shade. Illustrated on pages 166 and 167.

Gaylussacia dumosa, HUCKLEBERRY. A small deciduous creeping shrub to 1½ feet tall, with white, pink, or red, bell-shaped flowers, and black fruit. Native from Newfoundland to Florida and Louisiana, and very hardy. It requires a moist sandy humus soil in shade.

Genista anglica, BROOM. Densely branched very spiny shrub; sometimes procumbent, sometimes upright to 2½ or 3 feet. Flowers yellow, in May or June. Native to central and western Europe. Hardy to near zero. Like all Genistas, it requires perfect drainage, a nearly neutral deep and stony soil, and full sun.



Photo courtesy J. G. Bacher

Gaultheria (*Gaultheria Miqueliana*)

Genista germanica, BROOM. Erect or ascending spiny shrub about 2 feet tall, with hairy branches, and small yellow flowers in June and July. Native to central and southern Europe. Hardy below zero if grown in well-drained stony soil in full sun.

Genista hispanica var. **compacta**, DWARF SPANISH BROOM. A densely branched form, approximately 8 to 10 inches in height, with numerous thin spines, and golden yellow flowers in terminal heads or clusters in May and June. Hardy only above zero.

var. **nana**. A still lower form.

Genista pilosa, BROOM. An attractive trailing species with rooting stems, semi-evergreen leaves, and yellow flowers in May and June or July. Native to Europe, and hardy to zero or slightly below.

Genista radiata, BROOM. A much-branched species to 2 or 2½ feet tall, with heads of yellow flowers from May to July. The very narrow inconspicuous leaves are shed in early summer. The spineless green branches give the plant a broom-like appearance. Native to southeastern Europe. Hardy to zero.

Genista sagittalis, BROOM. A low procumbent species, with broadly winged fresh green branches, ascending to 8 or 10 inches. Clusters of showy bright yellow flowers in June. A good rock garden plant. Native to central and southern Europe. Very hardy.

Genista tinctoria var. **prostrata**, DYERS-GREENWEED. A low-lying form, with attractive golden yellow flowers in many-flowered racemes in summer. *Genista tinctoria* is native to Europe and western Asia. Very hardy.

Hedera Helix var. **conglomerata**, DWARF ENGLISH IVY. A slow-growing Ivy, with short stiff branches covered with crowded deeply crinkled evergreen leaves. An interesting rock garden plant. *Hedera Helix* is native to Europe. Var. *conglomerata* is hardy as far as zero.

var. **minima**. A dwarf form, about 12 inches high, with very small crowded leaves that turn purplish brown in winter.

There are numerous other small forms of *Hedera Helix*, which cannot all be enumerated here.

Helianthemum grandiflorum, SUN-ROSE. An evergreen more or less prostrate shrub adapted to border planting for mass color effect in June and July. There are several varieties varying in flower color from yellow to coppery red; also a double-flowered form. Height approximately 12 inches. Native to Europe and western Asia. Very hardy if planted in well-drained, neutral or slightly alkaline soil in full sun.



Photo courtesy J. G. Bacher

Broom (*Genista sagittalis*)

Helianthemum nummularium, SUN-ROSE. Very similar to the above in appearance. Distinguished by somewhat smaller flowers, and by its leaves, which are densely grayish hairy beneath. There are numerous varieties, some with double flowers, in colors ranging from white and pink to yellow, crimson, and copper. It may be used in the same manner as *Helianthemum grandiflorum*, and is equally hardy. Native to Europe and western Asia.

Hypericum adpressum, ST. JOHNS-WORT. A deciduous ornamental subshrub, woody only at the base, 1 to 1½ feet in height. Grown for its bright yellow flowers. Like all *Hypericum*s, it must be planted in full sun. It is native to the eastern United States and quite hardy.

Hypericum buckleyi, ST. JOHNS-WORT. A dense subshrub, with slender four-angled stems, forming neat rounded tufts not more than a foot high. Yellow flowers, produced singly or in groups of two or three, June to July. Native to the mountains of the Carolinas. Useful for rock gardens. Hardy to zero.

Hypericum calycinum, ROSE OF SHARON. An evergreen subshrub to 1 foot high, with procumbent four-angled stems. Large yellow flowers July to September. A rapidly spreading plant: an effective ground cover in sandy soil. Native to southeastern Europe and Asia Minor. Not hardy below zero.

Hypericum coris, ST. JOHNS-WORT. A rapidly spreading subshrub, 1 to 2 feet in

height. Leaves in whorls of four to six. Panicles of golden yellow flowers in late summer. Rather tender, and adapted only to the southern States. Native to southern Europe.

Hypericum galioides, ST. JOHNS-WORT. A small shrub, with slender stems to 3 feet high, sessile dark green crowded leaves, and yellow flowers. The plant usually forms a low round bush with handsome foliage and is attractive when in flower. It is native to the central United States, and is hardy to zero and somewhat below.

Hypericum Kalmianum, ST. JOHNS-WORT. A shrub 2 or 3 feet high, with four-angled stems and two-angled branches. Bright yellow flowers in August. Native to eastern North America. Handsome and hardy.

Hypericum patulum, ST. JOHNS-WORT. Evergreen or semi-evergreen spreading shrub, to about 3 feet tall, with two-edged purplish, arching branches. Large showy golden yellow flowers, July to September. Native to Japan. Rather tender. There are several varieties, some with still larger flowers.

Iberis saxatilis, CANDYTUFT. A small evergreen subshrub, about 4 to 5 inches high, with short, crowded branches, and small, very narrow leaves. Large clusters of showy white flowers in May. Native to southern Europe, and quite hardy under rock garden conditions of good drainage and full sun.

Iberis sempervirens, EDGING CANDYTUFT. A well-known rock garden plant, forming spreading cushions of compact dark evergreen leaves on erect branches one foot high. Covered with pure white flower clusters during May and June. Native to southern Europe and western Asia. Hardy to below zero.

var. **nana** and var. **compacta**. Dwarf forms.

Holly

There are a great many kinds of Holly, most of which are unfamiliar to the average gardener. There are only a few dwarf kinds (all of them varieties of the Japanese Holly), but their attractive foliage and shape give them great importance in this list.

Ilex crenata var. **Helleri**, DWARF JAPANESE HOLLY. A handsome evergreen slow-growing shrub, reaching a height of no more than 12 to 15 inches in twenty years. Suitable for rockeries and for low hedges. Hardy only above zero. *Ilex crenata* is native to Japan. Its fruits are black.

var. **globosa**. A dwarf compact globose form.

var. **Kingsville**. A very low and compact type with very small sharp-pointed dark green leaves.

var. **nummularia**. Another dwarf compact shrubby Holly, with broad crowded evergreen leaves.

Indigofera Kirilowii, INDIGO. A deciduous shrub of the Pea Family, to 3 or sometimes 4 feet in height. Grown for its showy rose-colored flowers, produced in foot-long dense racemes during June. Native to China and Korea. Hardy below zero.

Juniper

Among the Junipers are found some of the most useful of dwarf conifers. They are easy to grow as well as very hardy and show great variety in shape.

Juniperus chinensis var. **globosa**, JUNIPER. A low compact irregular round-topped bush, with short thick crowded branchlets bearing mostly scale-like bright green leaves. *Juniperus chinensis* is native to northern Asia and is hardy below zero. Like all Junipers, it thrives best in a well-drained, preferably sandy and slightly acid soil, in full sun.

var. **globosa aurea**. A golden form.

Juniperus chinensis var. **japonica**, JUNIPER. A diffuse, more or less trailing plant with ascending branchlets. Leaves mostly needle-shaped, dark green.

var. **japonica aurea**. Foliage tinged with golden yellow.

Juniperus chinensis var. **Sargentii**, JUNIPER. A seashore plant from northern Japan, forming prostrate mats 8 to 10 feet across. Leaves mostly scale-like and bluish green. Handsome and useful as a ground cover on exposed slopes.



Dwarf Japanese Holly (*Ilex crenata* var. *Helleri*)—cushion-form shrubs at right of steps

Juniperus communis var. **compressa**, JUNIPER. A very distinct form, with very short, fastigate, and densely crowded branches. Of extremely slow growth, rarely attaining a height of more than 2 or 3 feet. Not hardy below zero. It originated in Europe.

Juniperus communis var. **depressa**, PROSTRATE JUNIPER. A low spreading shrub, rarely more than 3 or 4 feet high. The common low Juniper of eastern North America. Very hardy.

var. **depressa aureo-spica**. Young growth golden yellow, coloring bronze in winter.

Juniperus communis var. **echiniformis**, HEDGEHOG JUNIPER. A tiny dark green globular form, with crowded short branches. Extremely slow-growing, and rarely exceeding 1 to 2 feet in height. It originated in Europe and is somewhat tender. It is rarely cultivated in America.

Juniperus communis var. **prostrata**, JUNIPER. A prostrate form, with its branches spreading horizontally so as to form an almost completely flat top. Found wild in Europe, but rarely cultivated, and scarcely known in America.

Juniperus communis var. **saxatilis** (var. **montana**), MOUNTAIN JUNIPER. A low, very wide-spreading shrub, 1 to 2 feet high. Needles dark green below, almost white above, turning bronze in winter. Native to the arctic regions and high mountains of Europe and North America. Suitable for the rock garden. Very hardy.

Juniperus conferta, SHORE JUNIPER. A wide-spreading, trailing shrub, found on sandy seashores in Japan, and hardy as far north as Massachusetts. Its fresh green needles turn red-brown during winter.

Juniperus horizontalis, CREEPING JUNIPER. A low shrub, with long trailing branches and short ascending branchlets. Some plants reach 8 inches high by 4 feet across. Native to eastern North America. Very hardy. Valuable as ground cover for sandy or stony soil. See illustration in color.

var. **"Bar Harbor."** A very fine compact form, of a nice bluish gray color, following the contour of the ground over which it grows.

var. **Douglasii**, WAUKEGAN JUNIPER. A prostrate shrub, with trailing branches, and steel-blue foliage turning purple in autumn. It forms a low dense mat completely covering the ground.

var. **glomerata**. A dwarf form, with branchlets crowded into dense clusters, and without long trailing branches.



Photo courtesy John A. Grant

Juniper (*Juniperus communis* var. *compressa*)

var. **procumbens**. The lowest form. Mature plants do not grow higher than 5 inches but spread to 12 feet in diameter. It is more or less bluish green in color.

Juniperus procumbens, JUNIPER. Low spreading shrub, usually not exceeding 1½ to 2 feet in height. Branches bluish white. Sharp-pointed needles glaucous above, bluish beneath. Very handsome and hardy, but frequently misnamed in cultivation. Native to Japan.

Juniperus squamata, JUNIPER. A broad low shrub, having long trailing stems with occasional smaller upright branches. Rather rare in cultivation. Native to China. Very hardy.

var. **prostrata**. A dense spreading bluish green mat, only a few inches high, and closely following the contour of the ground. A very desirable rock garden plant, deserving to be better known. Raised from seed collected by Wilson in China. Very hardy. Illustrated on page 160.

Juniperus virginiana var. **tripartita**, FOUNTAIN RED-CEDAR. A low-growing form, with irregularly spreading and arching branches, and short crowded branchlets. Color bluish green. *Juniperus virginiana* is native to eastern North America and is very hardy. Var. *tripartita* originated in Europe.

var. **reptans**. A prostrate form with bright green leaves, which originated in Europe.

Kalmia angustifolia var. **pumila**, LAMB-KILL, SHEEP-LAUREL. This compact dwarf form, rarely more than 1 foot high, is handsomer and more desirable than *Kalmia angustifolia*. The latter is evergreen, and has purple (or sometimes white) flowers, June to July; it is native to eastern North America and is very hardy. It requires an acid sandy soil.

Kalmia latifolia* var. *myrtifolia, DWARF MOUNTAIN-LAUREL. A very slow-growing evergreen low dense bush, with small deep green leaves to 2 inches long. The flowers are handsome, deep pink in bud, opening pale pink to white in June. The plant is hardy to below zero but needs partial shade and an acid humus soil. *Kalmia latifolia*, which is native to eastern North America, is one of the most beautiful of flowering evergreen shrubs.

Kalmia polifolia* var. *microphylla, BOG-LAUREL. A little dwarf shrub to 8 inches high, with erect very stiff branches, and small bluish green evergreen leaves. Rosy purple flowers in May on short stems. *Kalmia polifolia* is native to northern North America and is very hardy. It usually grows in bogs.

var. *nana*. A very dwarf form, of horticultural origin.

Lagerstroemia indica* var. *nana, CRAPE-MYRTLE. A deciduous shrub, with showy violet flowers in panicles all summer. *Lagerstroemia indica* is native to China, and is hardy as far north as Baltimore. At New York it usually freezes to the ground; but the rootstock survives with little protection, and flowers are produced in late summer.

var. *prostrata*. A prostrate form, with pink flowers.

Leiophyllum buxifolium, SAND-MYRTLE. A low-growing compact evergreen shrub, native to New Jersey, with small glossy leaves, and many clusters of little white flowers in May and June. It is a handsome little shrub, rather limited in adaptability, but does well if established in acid sandy soil in full sun.

var. *prostratum* (*Leiophyllum Lyonii*), ALLEGHENY SAND-MYRTLE. A dense prostrate shrub, with white or pink flowers in spring. Hardy to somewhat below zero.

Ligustrum obtusifolium* var. *Regelianum, REGELS PRIVET. A low dense deciduous shrub, to approximately 4 feet, with almost horizontally spreading branches, and oblong downy leaves. White flowers in nodding panicles in July. Native to Japan, and very hardy.

Ligustrum ovalifolium* var. *nanum, DWARF CALIFORNIA PRIVET. A dwarf half-evergreen shrub of upright habit, with glossy dark green leaves, and showy (though unpleasantly scented) flowers in July. *Ligustrum ovalifolium* is native to Japan and is not reliably hardy north of Long Island.

***Ligustrum vulgare* "Lodense"**, DWARF COMMON PRIVET. A dwarf compact deciduous shrub, with shiny leaves, and white fragrant flowers in dense clusters in June and July. *Ligustrum vulgare* is native to

Europe but is not reliably hardy much below zero.

Lonicera microphylla, HONEYSUCKLE. Low shrub to 3 feet, with opposite leaves, and fragrant yellowish white flowers in May. Native to central Asia, and hardy below zero.

Lonicera pileata, PRIVET HONEYSUCKLE. A low evergreen shrub with often prostrate branches. Leaves about 1½ inches long, shiny above; flowers whitish and fragrant, in pairs, in April and May. Native to central and western China, and not reliably hardy below zero.

Lonicera prostrata, HONEYSUCKLE. More or less prostrate deciduous shrub, forming dense mats. Flowers rather inconspicuous; fruits bright red. Native to western China. Not reliably hardy much below zero.

Lonicera spinosa* var. *Albertii, HONEYSUCKLE. A low, graceful, and attractive shrub, with slender arching or trailing branches and glaucous green leaves. Rosy pink flowers, fragrant, in June. Native to Turkestan, and very hardy.

Mahonia nervosa, OREGON-GRAPE. A dwarf evergreen thornless shrub to 1½ feet high, with alternate lustrous pinnate and spiny-toothed leaves. Flowers bright yellow in conspicuous panicles in spring, followed by dark blue berries. Native to western North America, and hardy below zero.

Mahonia repens, MAHONIA. A low evergreen shrub, spreading by runners, and rarely growing over 1 foot high. It has dull, bluish green leaves, and long racemes of yellow flowers followed by small blue berries. It is native to western North America, and hardy below zero.

Muehlenbeckia axillaris, WIRE-PLANT. A tiny shrub from New Zealand, more or less prostrate, forming fresh green mats about a foot in diameter. An excellent ground cover for bulbs. Not hardy below zero without snow protection.

Pachistima Canbyi, PACHISTIMA. A little evergreen shrub, forming attractive bushes about 10 inches high, with decumbent rooting branches, and small dark green leaves. Its flowers are inconspicuous. It is native to the mountains of Virginia and is hardy below zero.

Pachistima Myrsinites, PACHISTIMA. An evergreen small shrub to 1½ feet in height. Somewhat coarser in appearance than *Pachistima Canbyi*, and not quite so hardy. Native to western North America.

Penstemon heterophyllus* var. *erectus, BEARD-TONGUE. A dwarf horticultural form to about 1 foot in height, with evergreen leaves, and large showy blue flowers in June.

Penstemon heterophyllus is native to California and is rather tender.

var. **Purdyi**. A reclining mat-forming plant to 10 inches tall, with blue to light purple flowers. Equally tender.

Penstemon rupicola, BEARD-TONGUE. A dwarf prostrate bushy shrub about 3 inches high, with very small round thick fleshy leaves, and large rosy crimson flowers in June and July. Native to Washington. Hardy under rock garden conditions.

Penstemon Scouleri, BEARD-TONGUE. A low shrub to 1½ feet, with opposite leaves 2 inches long, and large bright lilac or white flowers. Native to western North America, and very hardy under rock garden treatment.

Pernettya mucronata, PERNETTYA. A much-branched low evergreen shrub, with small heath-like leaves, and urn-shaped, nodding, white or pinkish flowers. Fruits white to red or purple, throughout the winter. Rarely over 1 to 1½ feet in height. Native to Chile. It is rather tender, although it succeeds on Long Island.

Petrophytum caespitosum, PETROPHYTUM. A prostrate evergreen shrub, forming mats sometimes to 3 feet across. Small white flowers in dense short spikes on 3-inch stalks, during July and August. Native to western North America, and very hardy under rock garden treatment in full sun and in limestone soil.

Petrophytum Hendersonii, PETROPHYTUM. Very similar to the last. Stems ascending to 4 inches. Flower spikes somewhat longer. Native to Washington, and very hardy.

Philadelphus coronarius var. **duplex**, MOCK-ORANGE. A dwarf double-flowering form of the common and popular Mock-Orange. A deciduous erect shrub, with thin drooping branches, and fragrant creamy white flowers often solitary. *Philadelphus coronarius* is native to Europe and very hardy.

var. **pumilus**. A dwarf bushy form not over 1½ feet high, rarely producing flowers.

Phyllodoce caerulea, PHYLLODOCE. Very low evergreen heath-like shrublet, with ascending branches, small very narrow leaves, and urn-shaped pink or purple flowers. Circumpolar, and very hardy. All the *Phyllodoce* are suitable for rock gardens, but are rather difficult to grow except under naturally favorable conditions.

Phyllodoce empetriformis. Rosy purple bell-shaped flowers, and ascending branches to 6 inches high. Native to western North America.

var. **nana**. A very dwarf form.

Phyllodoce nipponica. White bell-shaped flowers. Native to Japan.

Physocarpus monogynus, NINEBARK. Deciduous spirea-like shrub with kidney-

shaped leaves, and white or pinkish flowers late in spring. About 3 feet in height. Native to the central United States. Hardy below zero.

Physocarpus opulifolius var. **nanus**, NINEBARK. A dwarf form of the common Ninebark, with small dark green leaves; rarely producing flowers. Very hardy. *Physocarpus opulifolius* is native from Quebec to Virginia and Tennessee.

Spruce

The ordinary Norway Spruce is well known even to the lay gardener; but not so familiar are the many handsome dwarf varieties of this and other Spruces.

Picea Abies var. **Clanbrasiliana**, NORWAY SPRUCE. A compact low dense bush, usually growing slightly wider than high; very slow in growth, in time forming a flat-topped round bush, rarely exceeding 6 to 7 feet in height. The oldest recorded dwarf form of Norway Spruce. Branchlets very short and crowded, with an annual growth of ¼ to ½ inch. Needles crowded, concealing the branchlet; very bright shiny green, very short, and tapering to a fine point. An old specimen in England measures 4½ feet by 8½ feet.

Picea Abies var. **diffusa**, NORWAY SPRUCE. A dense, close-growing, but wide-spreading bush, with very crowded and overlapping branchlets pointing out at a narrow angle. The needles are very short, soft, thin, flexible, and light yellow-green. A specimen at Kew Gardens, England, is 18 inches high by 4 feet wide.

Picea Abies var. **dumosa**, NORWAY SPRUCE. An extremely rare variety. A dwarf tufted shrub, with horizontally spreading branches, many branchlets, and short pointed needles.

Picea Abies var. **echinaeformis**, NORWAY SPRUCE. A very dwarf slow-growing distinct type, which forms a rather flat-topped cushion, with crowded branchlets and thin stiff tapering sharp-pointed needles.

Picea Abies var. **Ellwangeriana**, NORWAY SPRUCE. A pyramidal or roundish bush of vigorous growth and somewhat loose habit. Of American origin, and long known to nurserymen here. An old tree in Rochester, New York, has made a beehive-shaped bush 5 feet 2 inches by 5 feet 9 inches.

Picea Abies var. **Gregoryana**, NORWAY SPRUCE. A very dwarf form, rarely exceeding 2 to 3 feet in height, usually making a low, humped or conical bush. This name is listed in catalogs probably oftener than any other form of Norway Spruce but it is rarely true to name. The true var. *Gregoryana* has short crowded branchlets, very thin and fine, with narrow round needles ¾

to $\frac{1}{2}$ inch long, arranged radially on *all* the branchlets, irregular in direction.

Picea Abies var. *humilis*, NORWAY SPRUCE. A very dwarf, bushy, and compact shrub, not unlike var. *pygmaea* (see below). Branchlets minute and densely crowded with very small dark glaucous green needles.

Picea Abies var. *Maxwellii*, NORWAY SPRUCE. A very distinct form, raised about seventy years ago in the Maxwell Nurseries at Geneva, New York. It forms a low rounded cushion, the top of which is a mass of stout very short branchlets with thick leaves. The old plants at Rochester and Geneva are about 2 feet high by 4 feet through.

Picea Abies var. *Merkii*, NORWAY SPRUCE. A compact short-branched roundish form, rather low-growing, growing outward rather than upward, eventually forming a low broad pyramid. Branchlets very irregular. Annual growth $\frac{1}{4}$ to 1 inch; very thin straight needles, gradually tapering to a hair-like point.

Picea Abies var. *nana*, NORWAY SPRUCE. A very distinct and unusual, slow-growing form, making a flattened globose bush of very crowded ascending branches and short branchlets. One plant over 35 years old, in England, measures 4 feet by 4 feet.

Picea Abies var. *nidiformis*, NORWAY SPRUCE. This is an extraordinarily dense, crowded form, so densely branched that one wonders how the light ever reaches the lower branches. The branchlets are in tight layers, and grow outward and upward, leaving a nest-like depression in the center. Very flat thin narrow dark green needles cover the very fine branchlets.

Picea Abies var. *Ohlendorffii*, NORWAY SPRUCE. A very compact broadly conical shrub, with crowded fan-shaped branches and ascending branchlets. Needles thin, crowded, and closely pressed to the branches.

Picea Abies var. *procumbens*, NORWAY SPRUCE. A low bushy plant, with branches spreading horizontally over the ground. Annual growth $1\frac{1}{2}$ to $2\frac{1}{2}$ inches. The branches and branchlets form flat layers all pointing forward. A good specimen in the Arnold Arboretum measures about 18 inches high by about 4 feet across.

Picea Abies var. *pumila*, NORWAY SPRUCE. A low dense cushion, flat-topped except perhaps for a hump or two on top. Plants grown under this name are generally true. This variety has been grown for a great many years, and some specimens are over a hundred years old. These old plants measure 4 feet high by no less than 75 feet in circumference. The branchlets are short and closely set, making an annual growth of

about $1\frac{1}{2}$ inches. The needles are light shining green.

Picea Abies var. *pygmaea*, NORWAY SPRUCE. This is one of the smallest and densest forms of Norway Spruce. It is extremely slow-growing and makes a fairly compact conical bush with irregular branchlets. At Kew Gardens, England, a good specimen is 3 feet by $2\frac{1}{2}$ feet. The dense branches usually grow only $\frac{1}{4}$ to $\frac{1}{2}$ inch a year and are covered with short dark green thick needles.

Picea Abies var. *Remontii*, NORWAY SPRUCE. A very regularly conical variety, which has long been in cultivation in France. It has very fine and soft pale yellow-green needles on crowded ascending branchlets.

Picea Abies var. *tabuliformis*, NORWAY SPRUCE. A prostrate form, with slender branches spreading horizontally over the ground. Branchlets thin and flexible, not crowded. Needles flat and yellowish-green.

Picea glauca var. *conica*, WHITE SPRUCE. A beautiful dwarf Spruce, with short very compact branches and pale green needles. Narrowly conical in shape. Discovered in the wild in Alberta forty years ago, and now one of the most popular of the dwarf Spruces.

Picea glauca var. *nana*, WHITE SPRUCE. A round compact bush, rarely 6 feet high. Branchlets numerous and crowded, with a whitish bark. Annual growth about 1 inch. Needles short and stiff. Now rare in cultivation.

Picea mariana var. *ericoides*, BLACK SPRUCE. A roundish or conical slow-growing form, with slender flexible branchlets and very thin heath-like dark blue-green needles. Very rare in cultivation.

Picea mariana var. *nana*, BLACK SPRUCE. An ornamental very slow-growing globose dwarf form, with somewhat lighter blue-green needles than var. *ericoides*; otherwise rather similar.

Picea orientalis var. *nana*, ORIENTAL SPRUCE. A broadly pyramidal wide-spreading form, wider than high, with dense brown-needled branchlets and shining dark green needles.

Picea pungens var. *compacta*, COLORADO SPRUCE. See description and illustration on page 165.

Picea pungens var. *Hunnewelliana*, COLORADO SPRUCE. A dense pyramidal form, with thin supple pale whitish brown branchlets, and soft flexible pale green or grayish needles tapering to a sharp point. Annual growth 1 to 3 inches.

Picea pungens var. *glauca* clone "R. H. Montgomery," COLORADO SPRUCE. Slow-growing and very dense, rather regularly conical, bluish gray form, with stiff sharp

needles. The original plant at the New York Botanical Garden is about 20 years old and only 4 feet high. Illustrated on page 164.

Pieris japonica var. **pygmaea**, JAPANESE ANDROMEDA. A dwarf form with very narrow leaves. Andromedas are handsome evergreen shrubs with small bell-shaped white flowers in large terminal panicles in spring. All species thrive best in an acid sandy humus soil. *Pieris japonica* is native to Japan and is hardy to about zero or slightly below.

Pieris nana, PIERIS. A prostrate evergreen shrub, with white flowers in short clusters. Native to northeastern Asia, but unfortunately not hardy north of Virginia.

Pine

There are more than fifty species of Pine, but only a few have produced dwarf varieties, and not many of these are in cultivation.

Pinus Mugo var. **compacta**, SWISS MOUNTAIN PINE. Dense semiglobose form, with slender dark green needles. *Pinus Mugo* is native to the European Alps and the Balkans. Var. *compacta* originated in North America, and is very hardy.

Pinus Mugo var. **Slavinii**, SWISS MOUNTAIN PINE. The lowest form of Swiss Mountain Pine. It develops into a dense low-spreading mat, with erect short branchlets and crowded dark blue-green needles. A very old plant measures about 2 feet high by 6 feet wide. The variety originated in England.

Pinus nigra var. **Hornibrookiana**, AUSTRIAN PINE. This is a low compact form, with many stout ascending branches covered with stiff lustrous dark green needles. *Pinus nigra* is native to central and southern Europe. The variety originated at Rochester, New York, and is very hardy.

Pinus nigra var. **prostrata**, AUSTRIAN PINE. A knee-forming prostrate variety, with wide-spreading branches. Its origin is uncertain. It is rather rare in cultivation.

Pinus nigra var. **pygmaea**, AUSTRIAN PINE. A very slow-growing dense globular form, the needles twisted and forming a dense mat. Supposed to have originated as a witches'-broom.

Pinus parviflora var. **nana**, JAPANESE WHITE PINE. A dwarf very slow-growing plant, with few short erect branches and rather short needles. Var. *nana* originated in Japan, where *Pinus parviflora* is native. Rare in cultivation.

Pinus pumila, DWARF STONE PINE. A slow-growing, more or less prostrate plant, often without leader but with ascending

branches. The needles are dark bluish green, resembling those of the Swiss Stone Pine (*Pinus Cembra*), with which this species is closely related. It will eventually reach a height of 8 or 9 feet. It is native to northeastern Siberia and Japan. It is very hardy but somewhat exacting.

Pinus resinosa var. **globosa**, RED PINE. A rather strong-growing globular plant, compact and densely branched, with pale yellow branches and long densely crowded needles. *Pinus resinosa* is native to eastern North America. Var. *globosa* was discovered in New Hampshire in 1910.

Pinus Strobus var. **nana**, DWARF WHITE PINE. A dense flat-topped bush, seldom more than 2 or 3 feet high by as much wide. Not in cultivation, according to Hornibrook, though this name is frequently erroneously applied to other forms. (See illustrations on page 155.) *Pinus Strobus* is native to eastern North America.

Pinus Strobus var. **prostrata**, DWARF WHITE PINE. A distinct trailing form, with the branches spreading horizontally over the ground. An interesting mutant, which has occurred several times in cultivation among normal seedlings, in Europe as well as in America, but has also been found wild in Newfoundland.

Pinus Strobus var. **umbraculifera**, DWARF WHITE PINE. A very pretty form, with a round umbrella-shaped head of crowded slender branchlets. Annual growth about 1 or 2 inches. This variety originated in Europe.

Pinus sylvestris var. **nana**, SCOTS PINE. As usual, the name *nana* is frequently applied to other dwarf forms. The plant to which this name rightfully belongs, originated in England and is rather narrowly fastigate, with short stiff branches and crowded bluish green needles. It eventually reaches a height of over 10 feet. See illustration on page 156. *Pinus sylvestris* is native to Europe and Siberia.

Pinus sylvestris var. **pumila**, SCOTS PINE. Dwarf, more or less globose form, with crowded branches and stiff dark bluish green needles. It originated in Europe and is rare in cultivation in America.

Pinus sylvestris var. **Watereri**, SCOTS PINE. Somewhat similar to var. *nana*, but more broadly columnar, with short twisted steel-blue needles.

Potentilla fruticosa var. **mandshurica**, CINQUEFOIL. A low sturdy shrub, 1 to 2 feet tall, with small deeply cut whitish silky leaves and showy white flowers. Native to Manchuria. Very hardy.

var. *montana*. Slow-growing dwarf, 8 to 12 inches high, with yellow flowers.

var. *nana*. A dwarf compact form.

var. *parvifolia*. Dwarf shrub, 2 to 3 feet tall, with small fresh green leaves, and bright yellow flowers throughout summer. Native to central Asia.

Prunus pumila var. *depressa*, SAND CHERRY, DWARF CHERRY. Prostrate shrub with ascending branches, to 12 or 15 inches. In sand or between rocks on beaches and shores from Quebec to Massachusetts and Ontario. White flowers in May. Fruits small, purple-black. Very hardy.

Pseudolarix amabilis var. *Dawsonii*, GOLDEN-LARCH. A prostrate form which originated at the Arnold Arboretum. Rare in cultivation. *Pseudolarix amabilis* is native to eastern China and is very hardy but requires an acid sandy humus soil.

Pseudotsuga taxifolia var. *compacta*, DOUGLAS-FIR. A compact conical form of the Douglas-Fir, with short crowded branches and fine short bluish green radially arranged needles. *Pseudotsuga taxifolia* is native to western North America and is very hardy. Var. *compacta* originated in Europe.

Pseudotsuga taxifolia var. *densa*, DOUGLAS-FIR. A slow-growing irregularly spreading flat-topped form, wider than high, with horizontal branches. It originated at Rochester, New York.

Pseudotsuga taxifolia var. *globosa*, DOUGLAS-FIR. A small regular loose-branched globular form, with fresh green needles. It originated in Europe.

Pyxidantha barbulata, PYXIE, FLOWERING MOSS, PINE-BARREN BEAUTY. A creeping evergreen shrublet, forming a dense cushion. Leaves very small. White flowers solitary, but very numerous at the tips of the branches in March, April, and May. Native to pine barrens from New Jersey to North Carolina. Rather difficult in cultivation.

Quercus Havardii, SHINNERY OAK. A low deciduous shrub to 2½ feet. Leaves oblong, about 2 inches long, coarsely lobed or toothed, bright green, and pubescent beneath. Native to Texas and New Mexico. Hardy to about zero.

Rhododendron

Nearly everyone knows the familiar large Rhododendrons, with their handsome foliage and lovely flowers. Here are some of the little-known kinds—dwarfs—which are just as handsome, in their diminutive way.

Rhododendron calostrotum, RHODODENDRON. A dwarf species to 1 foot in height; with small aromatic leaves, heavily covered with gray scales on the upper side, and buff

beneath. Small deep rose or crimson flowers in April and May. Native to Burma. Not hardy below zero.

Rhododendron chamaeunum, RHODODENDRON. A dwarf rock garden species to 1 foot high, with small leaves, and deep rose-purple flowers marked with crimson. Native to western Yunnan. Not hardy below zero.

Rhododendron diacritum, RHODODENDRON. A procumbent shrub to about 2 feet high, with very small leaves densely scaly on both sides. Flowers dark rose-purple with a white throat. Native to Yunnan. Hardy to zero. It requires wet moraine.

Rhododendron didymum, RHODODENDRON. A most attractive small shrub, 2 to 3 feet high, with small dark green leaves in whorls, and crimson-black wide bell-shaped flowers in clusters of four in June and July. Native to southeastern Tibet. Quite hardy under rock garden treatment.

Rhododendron drumonium, RHODODENDRON. A small shrub to 1 foot high; with small leaves ⅓ inch long, scaly on both sides; and with pale bluish purple flowers nearly ½ inch long. Native to Yunnan. Hardy to zero. It requires wet moraine.

Rhododendron fastigiatum, RHODODENDRON. A very dwarf, erect shrublet, with small violet-purple to lilac-rose flowers in small clusters in June. Native to Yunnan, and rather tender. Many of the plants obtained under this name are really *Rhododendron impeditum*, which is similar in color but has a horizontal (rather than a vertical) habit of growth.

Rhododendron horaeum, RHODODENDRON. A trailing shrub, to 1 foot high or less. Leaves covered densely with brown felt-like hairs. Flowers deep crimson. Native to southeastern Tibet.

Rhododendron impeditum, RHODODENDRON. A very dwarf compact bush to about 20 inches high. Flowers in May, mauve or light purplish blue. Native to Yunnan. Hardy only above zero.

Rhododendron keleticum, RHODODENDRON. A semiprostrate shrub, to 6 inches high, with very small pointed leaves. Flowers deep purplish crimson, in May and June. Native to southeastern Tibet. Quite hardy on wet moraine.

Rhododendron leucaspis, RHODODENDRON. An upright shrublet, 1 to 2 feet tall. Flowers pure white and rather large, in April. Native to Tibet. Hardy to zero.

Rhododendron lysolepis, RHODODENDRON. A small shrub with erect branchlets and small scaly leaves. Flowers pinkish to dark violet, about 1 inch across. Origin unknown. Hardy only above zero.

Rhododendron myrtilloides, RHODODENDRON. A very dwarf shrublet with tiny box-like leaves, forming a tight cushion. Tiny flowers plum-colored outside and maroon inside. Native to northeastern Burma. Quite hardy on wet moraine.

Rhododendron parvifolium, RHODODENDRON. A small shrub to 1½ feet in height, with leaves ¾ inch long and scaly on both sides. Rose-purple, broad bell-shaped flowers in April and May. Native to northeastern Asia. Hardy under rock garden treatment.

Rhododendron pendulum, RHODODENDRON. A low shrub with trailing branches, in nature often epiphytic (growing upon other plants without taking nourishment from them). Leaves 2 inches long, woolly beneath. Flowers white, sometimes yellowish within. Native to the Himalayas. Rather tender, and difficult in cultivation.

Rhododendron prostratum, RHODODENDRON. Prostrate shrublet to 6 inches high, with rigid branches and small green leaves turned back at the edges. Flowers pink-violet, spotted red, about an inch across. Native to Yunnan. Quite hardy on wet moraine.

Rhododendron pumilum, RHODODENDRON. A very low semiprostrate shrub, to 6 inches tall, with scaly leaves and clear pink broadly tubular flowers. Native to southern Tibet, Burma, and Yunnan. It requires a wet moraine and is rather tender.

Rhododendron radicans, RHODODENDRON. A prostrate and mat-forming shrublet, 2 to 4 inches high. Roundish shiny leaves, and solitary terminal dark purple flowers. Native to southeastern Tibet. Quite hardy under rock garden treatment.

Rhododendron repens, RHODODENDRON. A low creeping shrub, 6 to 12 inches high, with dark green leaves and rather large scarlet trumpet-shaped flowers. The rooting stems cling to moist rocks. Native to western China. Rather difficult in cultivation.

Rhododendron saluense, RHODODENDRON. A small shrub to 2 feet high; short scaly leaves, and deep purple-crimson flowers with darker markings. Native to northwestern Yunnan. Hardy to about 15° above zero.

Rhododendron Sargentianum, RHODODENDRON. A small shrub no more than 2 feet in height, with small aromatic rusty scaly leaves. Flowers in clusters, rather small, pale yellow, in June. Native to western China. Hardy to about zero.

Rhododendron serpyllifolium, RHODODENDRON. A low much-branched shrub, with very small deciduous leaves, and rose-pink funnelform flowers to 1 inch across. Native to Japan. Hardy to about zero.

Rhododendron setosum, RHODODENDRON. A low-spreading shrub to about 15 inches high, densely branched, with many small scaly leaves, and bright purple-pink funnelform flowers in terminal clusters. Native to the Himalayas and southern Tibet. It requires rock garden treatment and is hardy only above zero.

Rhododendron tapetiforme, RHODODENDRON. A slow-growing carpet-forming shrub, rarely over 8 inches high. Flowers small, pink, funnelform. Native along the Tibet-Yunnan border. Quite hardy under rock garden treatment.

Rhododendron trichostomum, RHODODENDRON. A low densely branched shrublet, with small leaves and small rose or white flowers. Native to Yunnan. Rather tender.

Ribes alpinum var. **pumilum**, ALPINE CURRANT. A dwarf form of the Alpine Currant, with smaller leaves. *Ribes alpinum* is native to Europe and very hardy.

Rosa chinensis var. **minima**, FAIRY OR PYGMY ROSE. A miniature rose only 8 to 12 inches high, compact in habit. A gem in any rock garden, with its continuous display of perfectly shaped little flowers, red, pink, or white. Of horticultural origin. Hardy to somewhat below zero.

Rosa gallica var. **pumila**, FRENCH ROSE. A dwarf form, with creeping rootstock, and stems densely covered with prickles and bristles. Flowers single, red. Hardy to somewhat below zero. *Rosa gallica* is native to central and southern Europe and western Asia.

Rosa horrida, ROSE. A dwarf species, with small leaves, and white flowers about 1 inch across. Native to southeastern Europe and Asia Minor. Hardy to about zero.

Willow

Few people realize that the common Willows of the countryside have dwarf relatives that grow only a few inches tall.

Salix helvetica, WILLOW. A dense much-branched low shrub to 1 or 2 feet in height, with small entire leaves white-hairy beneath. Native to the European Alps. Hardy to below zero.

Salix herbacea, DWARF WILLOW. A depressed small shrub, with creeping stems (partly underground) forming dense mats. Branches sometimes ascending to 8 or 10 inches high. Native to the alpine regions of North America and Eurasia. Useful for rock gardens. Very hardy.

Salix myrsinites, WILLOW. A small shrub 12 to 15 inches high, with short densely leafy branches. Leaves lustrous green. Native to mountains of Europe and northern Asia. Very hardy.

Salix myrtilloides, WILLOW. A dwarf shrub 15 to 20 inches high, with creeping subterranean stems. Native to northern Europe and northeastern Asia. Very hardy.

Salix nivalis, WILLOW. Mat-forming creeping shrub, with short entire leaves, dark green above, glaucous beneath. Native to western North America. Hardy.

var. *saximontana*. A still smaller and denser form, to about 2 inches tall. Native to the Rocky Mountains. Very hardy.

Salix petrophila, WILLOW. A creeping shrub no more than 4 inches high, with bright green elliptic leaves. Native to western North America. Hardy to somewhat below zero.

Salix purpurea var. *nana*, DWARF PURPLE WILLOW. A dwarf form, of dense habit, with thin grayish branches and with slender leaves, bluish gray beneath. Very useful for low ornamental hedges. Very hardy. (See illustration in color.) *Salix purpurea* is native to Europe and Asia.

Salix repens var. *nitida*, CREEPING WILLOW. A small shrub rarely over 2 feet tall, with prostrate stems; leaves densely silky when young. *Salix repens*, which may be used also, is native to Europe and Asia and is very hardy.

var. *rosmarinifolia*. Very narrow, sharp-pointed leaves.

Salix reticulata, WILLOW. Low trailing shrub, with angled branches. No more than a few inches high. Rather large roundish leaves, dark green and roughly net-veined above, whitish silky beneath. Attractive and easily maintained in the rock garden. Native to Europe, northern Asia, and North America. Very hardy.

Salix retusa, WILLOW. Prostrate shrub with rooting branches and with oblong leaves green on both sides. Native to the mountains of Europe. Very hardy.

Salix Uva-ursi, BEARBERRY WILLOW. A prostrate arctic Willow, forming little mounds of thick branches. Rarely more than a few inches high. Leaves small, shiny green above, glaucous beneath. Subarctic regions and alpine summits of northern North America. Very hardy.

Santolina Chamaecyparissus, LAVENDER-COTTON. A much-branched evergreen shrub to 15 or 20 inches tall, with silvery gray leaves and stems. Much planted for edging. Native to southern Europe. Hardy to about 15° above zero.

Sarcococca Hookeriana var. *humilis*, SARCOCOCCA. Evergreen shrub to 3 or 4 feet, hardy on Long Island. Leaves dark shiny green; very small white flowers, in winter. Native to the Himalayas.

Spiraea albiflora, SPIREA. Compact deciduous shrub, 1½ to 2 feet tall, with stiff upright branches, smooth leaves, and white flowers in dense clusters in July and August. Origin unknown. Cultivated in Japan. Very hardy and handsome.

Spiraea bullata, SPIREA. A dwarf shrublet 12 to 15 inches high. Densely branched, with dark green crisp leaves. Deep pink flowers, in July and August, not very conspicuous. Native to Japan. Hardy to below zero.

Spiraea Bumalda, ANTHONY WATERER SPIREA. A hybrid between *Spiraea japonica* and *albiflora*. Compact upright shrub to about 2 feet, with white to deep pink or bright crimson flowers in dense clusters. Very hardy, and frequently planted for ornament.

Spiraea Bumalda var. "*Normandii*," SPIREA. A very dwarf little shrub, with oval dark green leaves on thin wiry stems about 4 or 5 inches high. Pink flowers in May. The foliage turns a brilliant crimson in fall.

Spiraea decumbens, SPIRAEA. A dwarf procumbent shrub, 8 to 10 inches high, with toothed smooth leaves, and white flowers in June. Useful for the rock garden. Native to Europe. Hardy to somewhat below zero.

Spiraea densiflora, SPIREA. A small shrub to 2 feet high, with dark red-brown branches. Flowers rose-colored, in dense clusters, in June. Native to western North America. Hardy to somewhat below zero.

Spiraea hypericifolia var. *nana*, SPIREA. A low compact form, hardy to below zero. The white flowers are produced in umbels in April and May. *Spiraea hypericifolia* is native to southeastern Europe and central Asia and is one of the earliest *Spiraea*s to bloom.

Symphoricarpos hesperius (*mollis* var. *acutus*), SYMPHORICARPOS. A deciduous trailing shrub, only a few inches high. Pinkish flowers rather inconspicuous; attractive white berries in the fall. Native to western North America. Hardy to below zero.

Symphoricarpos occidentalis and var. *Heyeri*, WOLFBERRY. Deciduous small shrubs, with grayish green leaves. Pinkish flowers in June and July, handsome white fruits in autumn. Native to western North America. Very hardy.

Symphoricarpos vaccinioides, SYMPHORICARPOS. A low much-branched deciduous shrub to 1 or 1½ feet high, with attractive white berries in the fall. Short elliptic leaves dark green above and glaucous beneath. Native to western North America. Hardy to about zero.

var. *decumbens*. A low creeping form.

Yew

Many of the Yews are so slow-growing that it is sometimes difficult to distinguish the dwarf kinds, and many of these are confusing because of their similarity.

Taxus baccata var. **compacta**, ENGLISH YEW. A small compact columnar form, with stiffly ascending branches and small recurving dark shiny green needles. *Taxus baccata* is native to Europe and Asia and is not hardy below zero.

Taxus baccata var. **nana**, ENGLISH YEW. A very slow-growing dwarf shrub, of rather irregular habit. An old specimen forms a low pyramidal bush, about 3 feet high and 3 feet wide. The needles are very short, thick, and dark green.

Taxus baccata var. **repandens**, ENGLISH YEW. A procumbent form, with long and wide-spreading branches. Needles dark bluish green. Eventually to 10 feet high. This is the hardest form of English Yew and stands temperatures well below zero. Illustrated on page 158.

Taxus canadensis var. **stricta**, CANADA YEW, GROUND-HEMLOCK. A low diffuse shrub with ascending branches. Needles fresh green, discoloring reddish in winter. Suitable for low hedges. It is very hardy but requires a rich humus soil in partial shade. *Taxus canadensis* is native to eastern North America.

Taxus cuspidata var. **densa**, JAPANESE YEW. Dwarf compact shrub, forming a broadly conical or rounded bush, less than 1½ feet high. Suitable for low hedges. *Taxus cuspidata* is native to northeastern Asia and is very hardy.

Taxus cuspidata var. **minima**, JAPANESE YEW. A very small dwarf, with broad shining dark green needles. A 15-year-old plant measures only 8 inches high by 8 inches wide.

Taxus cuspidata var. **Thayerae**, JAPANESE YEW. A broad vase-shaped form, with arched branches. The needles are slender and fresh green. Old plants at the Arnold Arboretum are 2½ feet high by 6 feet in diameter. This variety fruits freely and is very attractive in October and November, when it is covered with the red berry-like fruits.

Teucrium Chamaedrys, GERMANDER. An evergreen compact subshrub, 8 to 12 inches high, with small-toothed dark green aromatic leaves. Suitable for low hedges. Rosy purple flowers in July and August. Native to central and southern Europe and western Asia. Hardy to about zero. (See illustration in color.)

var. **prostratum**. A smaller form, making solid mats about 4 inches high, with short spikes of lavender flowers.

Teucrium montanum, GERMANDER. A prostrate subshrub, with small woolly grayish leaves. Pale yellow flowers crowded into hemispherical heads. Native to Europe and Asia. Hardy to about zero.

Arbor-vitae

Arbor-vitae are favorites in formal gardens and vary greatly in habit and color of foliage. The less common dwarf kinds are no exception.

Thuja koraiensis, KOREAN ARBOR-VITAE. A low-spreading shrub, usually with decumbent branches, to 2 or 3 feet high. Native to Korea. Hardy to somewhat below zero.

Thuja occidentalis var. **globosa**, ARBOR-VITAE "TOM THUMB." A dense globose form, of rather regular habit, with branchlets ascending at a very narrow angle. Fresh green in color. *Thuja occidentalis* is native to eastern North America and is very hardy. Var. *globosa* originated in Europe.

Thuja occidentalis var. **Hoveyi**, ARBOR-VITAE. A very compact oval bush, with narrow ascending branchlets and rather light green leaves.

Thuja occidentalis var. **pumila**, ARBOR-VITAE "LITTLE GEM." A compact dense form, broader than high, with dark green foliage. It originated in Europe.

Thuja occidentalis var. **umbraculifera**, ARBOR-VITAE. A low bush, round but flat-topped. The original plant at 15 years of age measured 2½ feet high by 3 feet across. It originated in Europe.

Thuja occidentalis var. **Woodwardii**, ARBOR-VITAE. A globose form, of dense habit, with erect or ascending branches and dark green foliage. It originated in Europe.

Thuja orientalis var. **decussata**, ARBOR-VITAE. A dwarf dense juvenile form, more or less globose, with spreading pointed bluish green needles. *Thuja orientalis* is native to China and Korea and is not safely hardy below zero.

Thuja orientalis var. **Sieboldii**, ARBOR-VITAE. A low compact subglobose or ovoid form, with bright green foliage arranged in vertical planes. Very regular in outline, and very handsome.

Thujopsis dolabrata var. **nana**, FALSE ARBOR-VITAE. A compact spreading flat-topped dwarf bush, rarely reaching 2 feet in height. Usually light green in color. Var. *nana* originated in Japan. Its branches, branchlets, and leaves are about half the size of those of *Thujopsis dolabrata*, which is native to Japan and hardy to about zero.

Hemlock

The few real dwarfs in this group all belong to the Eastern Hemlock (*Tsuga canadensis*). The one variety of the Carolina Hemlock, which is mentioned here, is rather vigorous in comparison.

Tsuga canadensis* var. *compacta, HEMLOCK. A dwarf conical form, with numerous short branchlets covered with small leaves. It is very hardy but requires an acid sandy humus soil. *Tsuga canadensis* is native to eastern North America.

Tsuga canadensis* var. *Hussii, HEMLOCK. A very dwarf shrub, with short twiggy branchlets and very short crowded leaves.

Tsuga canadensis* var. *minuta, HEMLOCK. See description and illustration in article on page 141.

Tsuga canadensis* var. *nana, HEMLOCK. A shrub of irregular open growth, with horizontally spreading branches and thin stiff branchlets. Rarely over 3 feet in height. Foliage yellowish green.

Tsuga caroliniana* var. *compacta, HEMLOCK. A low and very dense bush, about 10 feet high and about 12 feet through (at the Arnold Arboretum). It is round-topped, with branches in horizontal layers. It is regarded as one of the handsomest of dwarf conifers. *Tsuga caroliniana* is native to the mountains of Virginia and Georgia. Somewhat less hardy than *Tsuga canadensis*.

Tsusiophyllum Tanakae, TSUSIOPHYLLUM. A half-evergreen prostrate shrub to 20 inches high, belonging to the Heath Family. Flowers white or pale pink, to nearly ½ inch long. Native to Japan. Hardy to about zero. It requires a light acid humus soil.

Vaccinium Vitis-idaea, COWBERRY. A charming small evergreen shrub, about 8 inches high, with creeping rootstock. Forming compact little mounds of shiny dark green leaves. Showy clusters of pink flowers in May and June, followed by bright red edible fruits in late summer. Native to Europe and Asia. Hardy to somewhat below zero. It may be used as ground cover but requires an acid sandy humus soil.

var. *majus*. Larger leaves and fruits.

var. *minus*, MOUNTAIN CRANBERRY. Very dwarf, forming mats (of tiny dark green leaves) about 2 inches high. Native to northern North America, and very hardy.

Viburnum cassinoides* var. *nanum, VIBURNUM, WITHE-ROD. Dwarf compact bushy form with crinkly leaves. Rarely over 2 feet tall. Best propagated by stooling and division. *Viburnum cassinoides* is native to eastern North America and is very hardy. Var. *nanum* originated in Europe.

Viburnum Opulus* var. *nanum, EUROPEAN CRANBERRY-BUSH. A dwarf compact subglobose shrub, with smaller leaves than *Viburnum Opulus*. Usually not more than 2 or 3 feet in height. Rarely producing flowers. Best propagated by stooling and division. Very hardy. *Viburnum Opulus* is native to Europe and northern Asia.

Viburnum Wrightii* var. *Hessei, VIBURNUM. A small upright shrub, rather densely branched, 4 to 5 feet in height. Roundish dull green leaves turning crimson in autumn. Fruits bright red and showy. Native to Japan. Hardy to somewhat below zero.

Explanation of technical terms used in the descriptions:

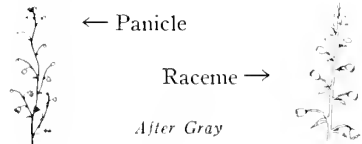
Decumbent: erect at base, then prostrate or reclining, but with the ends ascending.

Fastigate: with stems or branches erect and close together.

Panicle: a flower cluster in which the stalks of most of the individual flowers arise from *branches* (or subbranches) at various points along the main stalk or axis of the cluster (contrast raceme).

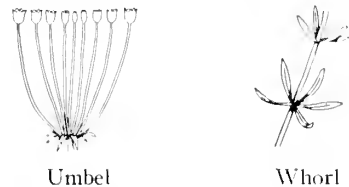
Procumbent: lying on the ground or trailing.

Raceme: a flower cluster in which the stalks of all the individual flowers arise from various points along the main stalk or axis of the cluster (contrast panicle).



Umbel: a flower cluster in which the stalks of the individual flowers (all about the same length) all seem to arise at the *tip* of the short main stalk.

Whorl: (of leaves) three or more at the same level along the length of the stem (in a circle).



(Concluded on inside of back cover.)

WITHIN THE BROOKLYN BOTANIC GARDEN

Harriet Low Hillard Fountain

A part of Brooklyn's history is preserved in a corner of the Botanic Garden where stands a bronze drinking fountain in memory of Harriet Low Hillard. The fountain, together with funds to set it in place, was presented by Miss Elma Loines.

It was first given in 1910 to the United Neighborhood Guild on Nassau Street by Mary Hillard Loines in memory of her mother, Harriet Low Hillard (1809–1877). Mrs. Loines, who lived to be almost a hundred years old, was noted for her public spirit and general interest in the welfare of Brooklyn. After her death the settlement home closed and the fountain reverted to the family. It has been placed on the terrace overlooking the Rose Garden. A circular flagstone walk now surrounds the base, and low shrubs have been planted in the back-ground.

Inscribed on the bowl is the motto:



"He prayeth well who loveth well
Both man and bird and beast."

Beneath the inscription are related the details of the original presentation of the fountain on May 18, 1910.

Please, What Shall I Do?

The compact, symmetrical shrub held by Alys Sutcliffe, Acting Horticulturist of the Botanic Garden, will be recognized by many as Winged Pigweed, or Tumbleweed (*Cycloloma atriplicifolium*). It arrived with a plea—typical of the daily problems handled by the Botanic Garden—from Carrillo & Green Associates, consulting engineers for the New York International Airport, where it is fast becoming a pest and might easily present a serious fire hazard. Control methods recommended were clean cultivation; removal by hand in late August or early September, before seeds are formed;



treatment with 2,4-D between July 15 and August 15.

BROOKLYN BOTANIC GARDEN OF THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES

Botanic Garden Governing Committee

LEONARD P. MOORE, *Chairman*

MISS HILDA LOINES, *Vice-Chairman*

H. RUSSELL BURBANK
MRS. LEWIS W. FRANCIS
PAUL F. FRESE
ANDREW J. GONNOUD
WALTER HAMMITT
WILLIAM T. HUNTER

EDWIN P. MAYNARD
RUTHERFORD PLATT
MRS. THOMAS H. ROULSTON
PAUL D. SHAFER
DONALD G. C. SINCLAIR
BERNARD H. SMITH

ADRIAN VAN SINDEREN, *Ex officio*

Director of the Botanic Garden

GEORGE S. AVERY, JR.

(Continued from page 191.)

Partial List of Books Used in Preparing the List

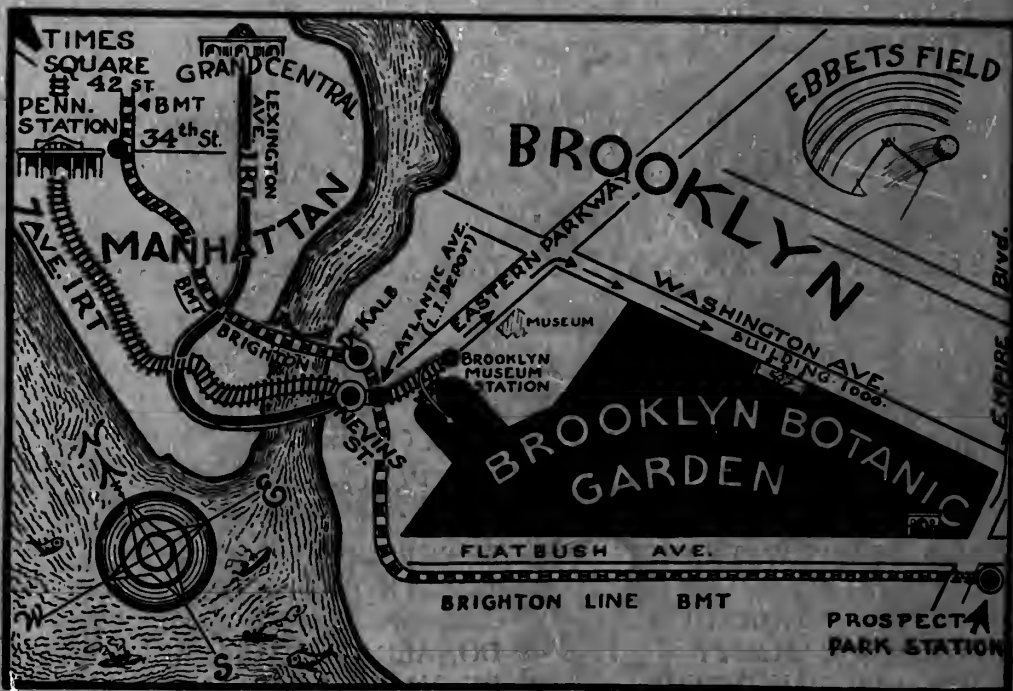
Dwarf and Slow-growing Conifers, 2nd edition, by Murray A. Hornibrook. Published by Country Life, Ltd., London, England, and Charles Scribner's Sons, New York, 1938.

The Standard Cyclopedia of Horticulture, 2nd edition, by L. H. Bailey. 6 volumes. Published by The Macmillan Co., New York, 1914.

Hortus Second, by L. H. Bailey and Ethel Zoe Bailey. Published by The Macmillan Co., New York, 1941.

Shrubs in Colour and Cultivation, revised edition, by T. C. Mansfield. Published by Collins, London, England, 1946.

Manual of Cultivated Trees and Shrubs, 2nd edition, by Alfred Rehder. Published by The Macmillan Co., New York, 1940.



TO VISITORS

To reach the Garden:

By SUBWAY: from Manhattan, twenty-five to thirty minutes' ride from Times Square or Grand Central.

I.R.T., West Side (7th Avenue or Broadway-7th Avenue line), downtown express marked "New Lots Avenue" or "Flatbush Avenue," to Eastern Parkway-Brooklyn Museum Station.

I.R.T., East Side (Lexington Avenue line), downtown express marked "New Lots Avenue" or "Utica Avenue" or "Atlantic Avenue," to Nevins Street, step across platform and change to 7th Avenue or Broadway-7th Avenue train, ride to Eastern Parkway-Brooklyn Museum Station.

B.M.T., Brighton Beach line, downtown express or local to Prospect Park Station.

By AUTOMOBILE:

From Long Island, take Eastern Parkway westward, and turn left at Washington Avenue.

From Manhattan, take Manhattan Bridge, follow Flatbush Avenue Extension and Flatbush Avenue to Eastern Parkway; follow the Parkway to Washington Avenue, then turn right.

PLANTS & GARDENS

Winter, 1949

The Year's Highlights
in

Horticulture and Gardening

—

Care of Gift Plants
in the House

—

Guide to
Recent Non-technical
Books and Articles
about Plants



AUTHORS WHOSE ARTICLES APPEAR IN THIS ISSUE

HELEN M. FOX (Mrs. Mortimer J.) of Peekskill, New York, amateur gardener and author of several books on horticultural subjects.

MONTAGUE FREE, for 31 years horticulturist at the Brooklyn Botanic Garden and since 1945 Staff Horticulturist of Home Garden magazine; lecturer and well-known author.

WILLIAM GILMAN of Arlington, Vermont, free lance writer on a wide range of subjects, but especially interested in horticultural practice as it affects farming and the maple sugar industry.

WALTER H. HODGE, Professor of Botany at the University of Massachusetts, Amherst, Mass.

J. W. JOHNSTON, Horticulture Editor, The New York Herald Tribune.

E. L. KAMMERER, Arboriculturist at the Morton Arboretum, Lisle, Illinois.

ALEX LAURIE, Professor of Horticulture at Ohio State University, Columbus, Ohio.

ROY NORDINE, Propagator at the Morton Arboretum, Lisle, Illinois.

REX D. PEARCE of Moorestown, New Jersey, grows rare plants and deals in their seeds.

FRANCES K. ROBERSON (Mrs. L. N. Roberson) of Seattle, Washington, collector and dealer in plants for rock gardens and pools; writer on garden subjects.

ROY E. SHEPHERD, Chairman of the Committee on Old Roses, American Rose Society, and author of articles pertaining to rose culture.

ALYS SUTCLIFFE, Acting Horticulturist at The Brooklyn Botanic Garden; author of many articles on garden practice.

RICHARDSON WRIGHT, Editor of House and Garden, and author of many books and articles on gardening and horticulture.

PLANTS & GARDENS



Tulipa Batalinii

5804

NEW SERIES

Winter, 1949

VOL. 5, No. 4

CONTENTS

Cover—Winter's Blanket in the Botanic Garden

Authors whose Articles Appear in this Issue	Page 2 of Cover
Frontispiece	Winter Visits the Botanic Garden 194
Director's Letter	195

Articles Condensed or Reprinted

Find Space for More Climbing Roses	<i>Flower Grower</i> 196
Waterside Plants	<i>Arboretum Bulletin</i> (University of Washington) 200
Neglected American Plants for American Gardens	<i>Morton Arboretum Bulletin of Popular Information</i> 203
It's Smart to Raise Your Hardy Perennials from Seed	<i>Flower Grower</i> 208
When to Call the Tree Doctor	<i>The Home Garden</i> 212
A Sky Garden Grows in Brooklyn	<i>New York Herald Tribune</i> 215
Gardening With Pots Out-of-Doors	<i>Journal of The New York Botanical Garden</i> 218
What Makes a Plant Hardy?	<i>The Home Garden</i> 221
The Place of Small Gardens in Your Life	<i>Bulletin of The Garden Club of America</i> 224
Maple—The Mystery Tree	<i>Nature Magazine</i> 229
Carnivorous Plants	<i>Natural History</i> 232

Original Articles

Propagation of Hardwood Cuttings	Roy M. Nordine 238
Care of Gift Plants in the House	Alys Sutcliffe 240
Selected List of Non-technical Books, Magazines and Articles, and Experiment Station Bulletins from all Sections of the Country	243
Within the Brooklyn Botanic Garden	250
Index to Volume 5	251

Drawings by Michalena L. Carroll, except those on page 214

The Editorial Committee for this Issue:

CONRAD B. LINK MICHALENA L. CARROLL
and Members of the Staff of the Brooklyn Botanic Garden

Published quarterly at Prince and Lemon Streets, Lancaster, Pa., by the Brooklyn Botanic Garden, Brooklyn, N. Y.
Entered as second-class matter, May 26, 1945, at the post-office at Lancaster, Pa., under Act of August 24, 1912.
Subscription included in Botanic Garden membership dues. To others: \$2.00 per year; \$3.50 for two years.

Copyright, 1950, by the Brooklyn Botanic Garden

**NOTICE OF CHANGE OF ADDRESS AND ALL OTHER CORRESPONDENCE
SHOULD BE ADDRESSED TO:**

BROOKLYN BOTANIC GARDEN, BROOKLYN 25, N. Y.



Winter Visits the Botanic Garden 11,482

Except where otherwise credited, photographs by

THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES
BROOKLYN BOTANIC GARDEN
1000 WASHINGTON AVENUE
BROOKLYN 25, NEW YORK
TELEPHONE: MAIN 2-4433

Winter 1949

The articles in this fifth winter Review Number of PLANTS & GARDENS have been chosen for variety of ideas and horticultural interest and significance. In making the selection it was the intent of the Editorial Committee to honor the authors of the original articles and the publishers of the many different magazines in which they first appeared. We hope those so honored will gain satisfaction from the special recognition given their work by the Brooklyn Botanic Garden.

PLANTS & GARDENS would not be doing the proper job for its readers, amateur or professional, or for nurserymen and plantsmen, if it did not call attention to plants that are unusual and often difficult to obtain. We sometimes receive inquiries asking why we do not give the names of firms that can supply the less common plants. If and when it becomes our policy to accept advertisements, growers of unusual material will be invited to place announcements of what they have to offer. Meanwhile, we are glad to answer as many inquiries as possible about where specimens may be obtained. Naturally, some of the rarer plants are not yet available in the trade. It is the search for these that makes plant hunting and plant collecting so rewarding.

Conrad B. Link and the Editorial Committee have worked carefully to select the most significant articles in 1949. We hope readers will approve and want to bind this issue with others for permanent reference.

PLANTS & GARDENS for Spring 1950 will feature flowering trees, and our Guest Editor will be Donald Wyman of the Arnold Arboretum.



Director

Please Note:

Title page and contents of the 1949 volume will be sent to libraries for binding and will be available to individuals upon request.

Information about earlier issues appears on the back cover.

FIND SPACE FOR MORE CLIMBING ROSES

The biggest bargain in flowering vines that you can buy

R. E. Shepherd

Condensed from *Flower Grower*, March, 1949

THERE are many ways to use rose climbers in our gardens. Almost every property has room for at least one rose of the vine type.

In most rose catalogues we find that the large group of roses generally referred to as "Climbers" is divided into three classes—climbers, ramblers and pillars. Considerable confusion results in any attempt to decide in which class many of them belong. A rose that is classified as a pillar may become quite rampant if it is grown in rich soil and a favorable climate and so would justify the title "Climber" or " Rambler." Practically all

Copyright, 1949, Williams Press, Inc., 99-120 North Broadway, Albany, N. Y.



McFarland photo

A large-flowered climber may be used to frame a bay window



Gottschö-Schleisner

Climbers may be trained over a wall. Set bushes on north, or shady, or uphill side; they may be tied to wire fastened to stakes driven in between rocks, and thus arched over the wall

the leading catalogues state clearly whether a variety is large- or small-flowering and whether it is vigorous or not. These two facts are of major importance as they answer the all important problems of pruning and location.

Pruning

Generally speaking the types that bear small blossoms in clusters, and whose growth is rather long and whip-like, should be pruned in the summer after they are through blooming. Roses of this group are actually biennial, as the canes are of little value after they have produced one crop of flowers and so should be removed. New shoots arise each year from the crown, but new branches rarely break from the tops of old ones.

The roses that bear large blossoms should be pruned less vigorously and only enough to remove dead wood and unnecessary canes. These types produce their blossoms on spurs that arise from old wood and so one will readily realize that the removal of all old wood will prevent the production of flowers. It is occasionally advisable, however, to cut

out a very old cane that has become too woody, and possibly diseased, to permit a vigorous new one to take its place.

There are many pet theories as to the best method of pruning the climbers, but if the plant is trimmed to fit the space it occupies and to serve the purpose for which it is intended the results should be quite satisfactory.

Under average growing conditions, a climber, rambler or pillar rose is rarely at its best until the third season after planting. However, when they do reach their prime, the glory of these roses more than compensates for the wait, although the season of bloom for most of them is comparatively short. There are a few so-called everblooming varieties and others that repeat sparingly in the fall, but the vast majority bloom only once.

Hybrids

Practically all of the early hybrids are descended from either *Rosa multiflora* or *Rosa wichuraiana* and few if any were introduced previous to 1893. Some of these earlier hybrids are still popular but most of them have been forgotten.



Weathered gray bars of a split-rail fence contrast beautifully with most rose colors. Pale pink New Dawn is used here

Roche photo

Uses for Roses

Dorothy Perkins is a typical wichuraiana rambler and is probably the best known of all roses in this class. It is ideal as a ground cover and, like all other varieties having thin flexible canes, can be trained as a weeping standard if attached to a post. The great majority of the ramblers are not at their best when planted against a wall as the foliage is likely to become vermin-ridden and mildewed. A free circulation of air through and around the plant is beneficial. When used as a ground cover, the canes of Dorothy Perkins, and similar roses, will take root wherever they come in contact with the soil and soon form a dense mat.

Dr. W. Van Fleet (also a wichuraiana hybrid) is a typical climber. Roses of this type, if given adequate support, grow higher and higher each year. They are thought of primarily for their capacity to clamber over a trellis or up the side of a house on a support of some sort.

A pillar rose may be described as one that lacks the vigor of a climber and the wood is too short and stiff to ramble. Any climber or rambler can be trained as

a pillar rose. All upright growth is encouraged. Horizontal growth is restrained by shortening all wood back to two or three eyes. The new growth that is produced by the remaining eyes is the blooming wood of the following season and by pruning in this way, a pleasing formality and regularity in appearance is obtained. This training should be repeated after each blooming season and the older wood should be removed occasionally, at the base, to encourage new and vigorous growth.

Making Supports

There are various methods of supplying support. A sturdy stake, or post, may be placed near the crown of the plant and a wagon wheel attached to the top of it through the hub. The canes are trained between the spokes and the ends are clipped off when they reach the desired height. The height of the wheel from the ground will depend upon the vigor of the variety. For vigorous varieties five feet is desirable.

Four strong stakes placed close to the crown and radiating outward to about

three feet apart at a height of four feet and braced with a lighter wood is a method frequently used in England for training vigorous climbers. Suitable canes are trained up the stakes and tied together at the tips. Later the entire effect resembles that of a glorified balloon.

Garlands of Roses

In this method of training, posts are set about ten feet apart and so that they extend eight feet above the ground. Midway between each post a shorter one about five feet in height is set and a chain is draped from post to post. Varieties of roses which have soft pliable canes are probably the most suitable and form the most graceful garlands. As they grow the canes are wrapped around the post (one clockwise and another counter clockwise) until they reach the top and are then trained along the chain in both directions.

Worth-while Roses

The varieties listed in the accompanying table are, in my opinion, dependable



McFarland photo

For best effect against fences space plants so pickets or rails are not entirely obscured

and worth-while. No attempt has been made to classify them as climbers, ramblers or pillar types.

Dependable Climber, Rambler and Pillar Roses

Albertine	Excelsa	Mme. Gregoire Staechelin
American Pillar	Federation	Paul's Scarlet
Blaze	Fraulein Octavia Hesse	Phyllis Bide
Bonfire	Gardenia	Polaris
Christine Wright	Gerbe Rose	Purity
City of York	Golden Glow	Solarium
Climbing American Beauty	Ghislaine de Feligonde	Star of Persia
Crimson Conquest	Hamburg	Tausendschon
Crimson Rambler	Heart of Gold	Thor
Doublons	Hiawatha	Trier
Dr. Huey	Leontine Gervais	Violette
Dr. W. Van Fleet	Lovett varieties	Wichmoss
Dream Girl	Mermaid	Zephirine Drouhin



WATERSIDE PLANTS

Frances Kinne Roberson

Condensed from *Arboretum Bulletin*, University of Washington Arboretum Foundation, Spring, 1949

THE number of plants which may be grown beside a pool or stream is limited—by the degree of moisture present, the space available, exposure, and the effect desired.

The use of mass plantings is as important here as elsewhere but remains relative to the scale of the water garden and the area surrounding it. Naturalness is a highly desirable aim, as is a long season of bloom. Harmony of foliage texture and blending of flower colors both require careful attention. But simplicity should be the keynote of the plan and of the waterside garden which results.

Some of the same plants which help create an harmonious picture inside the border of the pool also fit into waterside plantings. Plants which do not resent actually having their feet in the water

include water forgetmenot (*Myosotis scorpioides*), that profligate which spreads by seeds and rooting stems until it even covers the water. Almost as avaricious of space is creeping jenny (*Lysimachia*), with its rounded leaves and bright yellow flowers. These plants serve the useful purpose of holding soil in place while also contributing a long season of bloom.

Another rampagous yellow-flowered plant is water poppy (*Limnorchis flava*), whose running rootstocks send up new plants at frequent intervals so that one must eventually remove quantities of it. A plant of much less hardiness is water snowflake (*Nymphaeoides indicum*), aptly named, as anyone will agree when they have once looked at the intricate fashioning of the little white blossoms. The eastern marshmarigold, with its gay yellow flowers, and the western one, with white flowers, are welcome additions to the pool border by reason of their shiny leaves as well as because of their handsome flowers.



6533

Yellow Flag (*Iris pseudacorus*) bordering brook

Mimulus moschatus and other yellow-flowered monkeyflowers will hold their own in competition with the foregoing plants. Equally tenacious of life and slightly taller is the lovely pink flowered *Mimulus lewisii*. Other native plants harmonizing in texture with the monkeyflowers are piggyback plant (*Tolmiea menziesii*) whose new young plants spring from the axils of the old leaves; fringe-cup (*Tellima grandiflora*), with its tall spikes of greenish, lily-of-the-valley like flowers; bishopscap (*Mitella trifida*), and coolwort (*Tiarella trifoliata*) with its dainty flower sprays; and, of course, maidenhair fern and deerfern.

Low in stature and often seen with deerfern is dwarf cornel (*Cornus canadensis*). This miniature dogwood requires careful handling and transplants best when a whole sheet of top soil is skinned from the ground with all the plants intact. In such clods there are apt to be: *Clintonia uniflora* with the limber strap-like leaves embracing the stem which supports one milk white flower; goldthread (*Coptis asplenifolia*); young plants of red huckleberry (*Vac-*

cinium parvifolium) which may later crowd out its less stalwart neighbors; and mosses of many sorts which fit themselves in between the other plants.

Suitable only for large areas and mass effects are the arrowheads (*Sagittaria*). Other plants in the same category as to height and usefulness are pickerel rush with its contribution of blue flower, bog arum with the disagreeable odor which is emitted from this attractive calla lily, umbrella plant—although neither the large nor small forms are completely hardy here, and perhaps even skunk-cabbage deserves a place in this list. Pitcherplant (*Darlingtonia californica*) certainly adds an exotic note, though not altogether harmonious, in my estimation.

Still taller are *Iris sibirica* in white or various shades of blue, *Iris versicolor* with blue flowers, *Iris missouriensis* in either white or blue, *Iris pseudacorus* with yellow flowers, the Louisiana wild irises with their broad range of color including a tawny red, and the elite of this group, Japanese iris (*Iris kaempferi*), with its huge flattened blossom, single or double, light to dark blue,



Marsh-Marigold (*Caltha palustris*) likes wet meadows and edges of ponds

lavender to deep violet, white, solid colors or with pencilled markings.

The tallest of the bayonet-leaved bog plants, and perhaps the most widely associated with swamps, is the common cattail (*Typha latifolia*), but it should never be given a foothold unless its aggressive nature can be controlled by repeated removal of encroaching roots, or by a barrier, such as a concrete wall, to protect areas reserved for less voracious plants. Equally aggressive but more attractive is purple loosestrife.

Background plants composed of native material might include: the aptly named goatsbeard (*Aruncus sylvestris*) with its drooping spikes of white flowers soon turning brown; two representatives of the rose family, the pink-flowered western steplebush (*Spiraea douglasii*), so-called because of the spired form of flower, and the foamy white-flowered oceanspray (*Holodiscus discolor*); and some form of snowberry, particularly one of those which bears extra large berries in great profusion.

An elderberry tree (*Sambucus*) grows sufficiently tall to supply a high center of interest even though the weakness of the pithy wood makes it necessary to keep constant watch for breakage and to thin out old branches. Equally compatible with the waterside garden is the rounded outline of either *Sambucus caerulea* with its black berries appearing blue-gray, or *Sambucus callicarpa*, with its smaller scarlet berries.

Certain rank growing plants such as mint and bamboo, sedges and reeds, have purposely been omitted from the foregoing list but there remain many more wholly desirable plants which should be mentioned.

Several of the St. Johnsworts have an affinity for moisture. The tiniest one I know is a native (*Hypericum anagalloides*) which carpets wet banks with its light yellow-green leaves, in the axils of which appear the very small yellow blossoms. Yellow flowered also is the swamp

buttercup but it is too rank growing to be introduced into the cultivated garden. It is far better to depend on globeflower for some yellow blossoms. These may be had in low or medium tall plants, such as *Trollius acaulis* and *Trollius europaeus*, respectively.

The insectivorous sundews also vary considerably in size. Oddity rather than beauty is their claim to garden interest. Two local species are *Drosera rotundifolia* and *Drosera anglica*. The fascinating action of the sticky hairs on the sundew leaves never fails to make one marvel at the ability of this plant to capture and digest its animal food.

Colorful companions for the sundews abound. The iris family offers the purple to white-flowered *Sisyrinchium douglasii* and the yellow-flowered *Sisyrinchium californicum*. Shootingstar (*Dodecatheon jeffreyi*) is that saucy-flowered plant known by other common names such as mosquitobill, wild cyclamen and heronbill. Transient dwellers in a given spot are spring beauty (*Claytonia megarrhiza*) and miner's lettuce (*Montia parviflora*). They may show up in many unexpected places, but seldom reappear where sought.

Not all waterside plants need be bog or marginal ones. Some of them should be chosen for their lush habit of growth which we associate with plants having a plentiful water supply during the growing season, even though there may occur a drier period coinciding with the rest period of these plants.

One of the first names to come to mind in this category is *Primula rosca grandiflora*, followed by *P. cashmeriana*, *P. veitchii*, *P. sikkimensis*, *P. japonica* and *P. florindae*. A waterside garden planted with these primroses will be gay with color from early spring to midsummer.

Clumps of trilliums, violets and astilbe are welcome notes of interest where good deal of green background of fern or other foliage plants is present.

NEGLECTED AMERICAN PLANTS FOR AMERICAN GARDENS

E. L. Kammerer

Condensed from *Bulletin of Popular Information, Morton Arboretum*, February and March, 1949

EVER since the early colonists first set foot on the shores of the North American continent, bringing with them roots, slips and seeds of favorite plants from the old world, we have continued to turn to foreign lands for plant materials with which to enrich our gardens.

In a country favored with one of the richest floras in the world this is a strange anomaly, indeed, and one explainable only as the hesitancy of a pioneer to break the ties of a civilization he had left behind.

It was largely through the efforts of

Author's Note: Selections adaptable specifically to the Chicago region, but equally suitable for most parts of the U. S.

the early plant collectors, such men as Douglas, Kalin, Michaux, Menzies, Pursh, and others, sent over from Europe to seek out plant treasures, that the gardens of the old world became the centers of introduction for many of our choicest native plants.

Thanks to the combined endeavor of interested individuals and enterprising growers a majority of our finest native plants are available today, although a number are still relatively uncommon in cultivation due to a lack of knowledge concerning their geographical adaptability. This accounts for our mentioning certain species and varieties which may be considered commonplace in some sections of the country and at the same time rare and out-of-range in others.

While our native trees have for the most part enjoyed a rather wide-spread distribution, how seldom does one en-

Published by the Morton Arboretum at Lisle, Ill.



William C. Peck photo

For a low growing broad-leaved evergreen try *Pachistima canbyi* (foreground)



McFarland photo

Sweet Pepperbush (*Clethra alnifolia*)

counter such plant aristocrats as the chaste White Redbud (*Cercis canadensis alba*), an albino variety discovered in southwest Missouri; the gray barked Yellowwood (*Cladrastis lutea*), that native of limited limestone regions of North Carolina, Kentucky, and Tennessee, whose Wisteria-like flowers droop so gracefully

from its leafy branches in early June; the dainty Silverbell (*Halesia carolina*), a shrubby tree of shaded ravines and wooded mountainsides, whose branches fairly drip with dainty bell shaped white blossoms in late April or early May; or the even handsomer Mountain Silverbell (*Halesia monticola*), a taller, more vig-

orous tree of exceptional floriferousness. A pink flowered variety of it has been found, too, a real rarity for the collector. The bold appearing Umbrella Magnolia (*Magnolia tripetala*) is another Southerner hardly much farther north than generally supposed. Its spectacular twelve to eighteen inch leaves radiating from the ends of the branches in the manner of an open umbrella, are immense in comparison with other magnolias. Autumn is the season when the attractions of two other lesser grown trees become most prominent, Sour Gum or Tupelo (*Nyssa sylvatica*), with such glowing orange scarlet or reddish purple fall color, and the Sourwood or Sorrel Tree (*Oxydendrum arboreum*). The latter is a smaller tree with a decided preference for a sour soil, and commands attention not only by its vivid reddish purple leaf color but also because of its conspicuous clusters of tiny white urn shaped flowers in July. The Shingle Oak (*Quercus imbricaria*) is a fine shade tree with leathery unlobed leaves as glossy and green as those of the Bay Laurel. Among conifers the deciduous Bald Cypress (*Taxodium distichum*) is hardy in well drained soil as far north as southern Wisconsin. The tree's habit of growth is narrow-pyramidal becoming rounded with age, and it is furnished with pleasing foliage of ferny texture and soft green coloring. The graceful Carolina Hemlock (*Tsuga caroliniana*) is another beautiful southern tree, hardy enough in this area but too intolerant of our dry summers and hot winds to be recommended.

While the Buckeye and Horse Chestnut can scarcely be considered unusual, the dwarf forms of the genus *Aesculus* are not generally known. From east Texas comes an attractive species, "*arguta*," appropriately known as the Texas Buckeye. Semi-shrubby in habit, it puts out a profusion of candle-like spikes of pale yellow flowers in May. Southeastern United States is the native habitat of several other splendid forms, notable par-

ticularly for their late season of bloom—the Scarlet Woolly Buckeye (*Aesculus discolor mollis*); the Bottlebrush Buckeye (*Aesculus parviflora*), and a taller, later blooming variety of the latter, "*serotina*."

The misty Shadblows or Juneberries are a familiar part of the spring landscape and of them all none is lovelier than the Apple Shadblow (*Amelanchier grandiflora*), a natural hybrid between "*canadensis*" and "*laevis*," known to occur only in a few localized areas of New York state. Everything about it is pleasing, the graceful way it extends its branches, the color of its foliage in spring and fall and its pendulous racemes of white flowers. Any list of "best" southeastern and southern woody plants would most certainly include the Fringe Tree or Old Man's Beard (*Chionanthus virginica*), a bushy shrub or small tree grown for its remarkable fringy white, scented blossoms opening in early June and blue fruits in September. In areas where the Flowering Dogwood is not dependably hardy, there is another ornamental *Cornus* whose distinctive habit of growth offers a useful substitute. This is the Alternate-leaved or Pagoda Dogwood (*Cornus alternifolia*), a tall shrub whose branches are similarly arranged in definite horizontal tiers. While the flattened cymes of small, pale yellow flowers can scarcely compete with the Flowering Dogwood's large, cup-shaped blooms the red stemmed blue-black fruit is quite as handsome in its own way.

In 1765 Dr. Alexander Garden of Charleston, South Carolina, sent Linnaeus a specimen of a neat appearing woody plant with pretty drooping cylindrical racemes of small white flowers and lustrous green leaves. It was the Leatherwood (*Cyrilla racemiflora*), a little known shrub or shrubby tree found from Virginia southward. Its gorgeous fall foliage display, orange scarlet to purplish red, is more than sufficient justification for its planting. Dr. Garden was also responsible for the introduction of the



Sour Gum (*Nyssa sylvatica*) has handsome autumn foliage and interesting form in winter

large Fothergilla or Springscent (*Fothergilla major*), that choicest native of the Alleghenies whose sweet-scented white "bottlebrush" flowers (May) possess a distinction all their own. Glorious fall coloring adds to its desirability. Our rarest native is perhaps the late flowering Franklinia or Gordonia (*Franklinia alatamaha*), a charming small tree which came near being lost to cultivation. John Bartram found it growing wild along the Alatamaha River in Georgia in 1765 and carried slips of it in his saddlebag back to his garden in Philadelphia. It has never been rediscovered in the wild since. In the same class as regards hardiness is the very decorative Mountain Stewartia (*Stewartia ovata grandiflora*), another native of the state of Georgia prized for its beautiful white cup-shaped blooms.

In the Vernal Witchhazel (*Hamamelis vernalis*), the Ozarks have given us a

shrub which still holds the record of being the earliest woody plant to blossom. The Oakleaf Hydrangea (*Hydrangea quercifolia*), is at last beginning to take its rightful place among ornamental shrubs. We might reemphasize its ability to thrive in deep shade. Snowwreath is a descriptive name for *Neviusia alabamensis*. Although the shape of the bush suggests a Spiraea, upon seeing it in blossom in June and July one will note the floral clusters are made up of bunches of white stamens pleasingly arranged along the recurving branches. The Snowwreath must have perfect drainage and protection if it is to succeed in the north. *Pachistima canbyi*, a diminutive evergreen shrublet from the mountains of Virginia, West Virginia, and Kentucky, needs little introduction as a ground cover or low edging. Neat of habit and with fine textured shiny green leaves, it is presentable at any season.

The mountain regions of the west have contributed generously to our list of ornamentals giving us such well known conifers as the Western Yellow Pine (*Pinus ponderosa*); the stately Douglas Fir (*Pseudotsuga taxifolia*); White Fir (*Abies concolor*); Colorado Blue and Green Spruces (*Picea pungens*) and (*P. pungens glauca*); Black Hills Spruce (*Picea glauca densata*); Alberta White Spruce (*Picea glauca albertiana*); the silvery Western Juniper (*Juniperus scopulorum*) and many others. Among western deciduous materials, however, the subjects are fewer and less familiar. While such plants as the Cliff Jamesia (*Jamesia americana*), a more refined relative of the Mockoranges; the Cream-bush Rockspirea (*Holodiscus discolor*) and some of the western *Ribes* have not taken kindly to our local growing conditions, we have had better success with the Oregon-grape Mahonia (*Mahonia aquifolium*) and the attractive Boulder Raspberry (*Rubus deliciosus*).

The absence of such fine species as *Viburnum acerifolium*, "nudum," "rufidum"

lum" and "trilobum" from many nursery catalogs and their rarity in plantings offers convincing evidence of the lack of information concerning them. The Mapleleaf Viburnum (*V. acerifolium*) we immediately associate with fall color, for no other species displays such an inclusive range. Fall color is also the outstanding feature of the Possumhaw Viburnum or Smooth Witherod (*V. nudum*), a tall shrub whose leathery lance-shaped leaves show no lobing. Lustrous deep green summer foliage characterizes the Rusty Blackhaw Viburnum (*V. rufidulum*), the southern counterpart of our native Blackhaw. The American Cranberrybush Viburnum, *Viburnum trilobum* (syn. "*americanum*"), may be identified by its prominently three-lobed leaves. We are attracted to its good looking flat-topped flower clusters (May-June), to the bright red translucent fruits effective from September on and to the typically handsome Viburnum fall foliage coloration.

Lest the question be raised as to the reason for the obvious omission of various other desirable natives, it may be explained that such fine plants as the following are for the most part already known and appreciated: American Mountain Ash (*Sorbus americana*); Bayberry (*Myrica pensylvanica*); Sweet Shrub or Carolina Allspice (*Calycanthus floridus*); Buttonbush (*Cephalanthus occidentalis*); Common Winterberry (*Ilex verticillata*); Dwarf Bushhoneysuckle (*Dicervilla Lonicera*); Fragrant Sumac (*Rhus aromatica*); Inkberry (*Ilex glabra*); Mountain Ninebark (*Physocarpus monogynus*); New-Jersey-Tea (*Ceanothus americanus*); Prairie Rose (*Rosa setigera*); Red Chokeberry (*Aronia arbutifolia*); Rose Acacia Locust (*Robinia hispida*); Scarlet Elder (*Sambucus pubens*); Silver Buffalo-Berry (*Shepherdia argentea*); Summer-Sweet *Clethra* (*Clethra alnifolia*) and Sweet-Fern (*Comptonia asplenifolia*).



Flowering branches of Witch Hazel
(*Hamamelis vernalis*)

Branches of Fothergilla, or Springscent,
(*Fothergilla major*) with partly opened
flowers





Gottsch-Sch

IT'S SMART TO RAISE YOUR HARDY PERENNIALS FROM SEED

Rex D. Pearce

Condensed from *The Flower Grower*,
April, 1949

IT'S fun to grow perennials from seed. And besides it's smart! You can have more of them and a far greater variety at very low cost. Of course, it takes a little more care to raise perennials from seed than it does to set a purchased plant in the ground.

The beginner will probably choose seeds of perennials that he already knows, and when he has succeeded with those

he may try more unusual kinds, moving by easy stages from the known to the unknown.

Some seeds require a fairly long exposure to low soil temperature. These kinds may be started in early spring while the ground is still cool enough to make conditions suitable. When grown from seed, lilies quite definitely fall into this group.

Other perennials with similar germination requirements are irises, liatris, dictamnus, aconitum, helleborus, penstemon, primula, saxifraga, hardy geranium, trolius, crenurus, hardy chrysanthemum,

Copyright, 1949, Williams Press, Inc., 99-129 North Broadway, Albany, N. Y.

azalea, anemone, alstroemeria, allium and, to a somewhat lesser degree, also armeria, gentian and aquilegia. Throughout the group there is a variation in the degree of low soil temperature needed.

Early spring sowings may be made in a coldframe but good results may be had also from seed sown directly in open ground seed beds. The advantage of a coldframe is the protection it gives from hard, beating, washing rains. A possible disadvantage is that the glass is likely to be left on when it should be off, thus raising temperatures of air and soil beyond what is desired and perhaps drying out the seedbed.

Seedbed Preparation

For open ground sowing it is not advisable to plant the seed where the perennials are finally to stand. The best way is to prepare a seedbed in some sheltered corner of the garden that is not shaded by trees. A bed 30 inches wide is easy to work. The spot should be well-spaded and broken up so the soil is fine without any lumps. Either compost or manure is then mixed in thoroughly. Commercial pulverized sheep or cow manure will do if other manure is not available. If your soil is on the lean side, or if the quantity of compost or stable manure is small, a light application of any commercial fertilizer may also be made.

Soil fertility has little effect on seed germination but it has much to do with how vigorously the seedlings grow afterward. On the other hand, the texture or condition of the soil may have much to do with the percentage and speed of germination.

A soil should be friable so that it will just barely hold together when a damp handful, not a soaked one, is squeezed. Neither heavy, sticky clay soil, nor a very light loam, will give just the right conditions for a seedbed. Be very sure the soil is deeply worked and the fertilizer well mixed with it. The bed may be slightly raised above the garden surface,

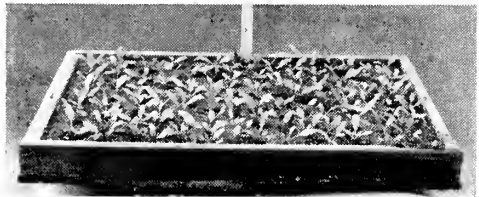
but this is not really necessary unless surface drainage is poor.

Sowing Methods

When seeds are sown in pots or seed pans under glass, the seeds are usually broadcast or scattered over the surface, but sowings made in larger containers, such as flats or seed boxes, will be more easily handled if sown in rows.

If seeds are sown somewhat thinly in the row, most of the hardy perennials can be left for one full year of growth in the flat.

The advantages of flats over direct sowing in the soil of coldframes are not great, but there may be some small advantage to those with little spare time,



Author photo

Oenothera seedlings six weeks after sowing seed, two weeks after moving into flats

for sowings in flats can be made under shelter on rainy days, or during the evening, the flats later being placed in the coldframe. Also plants grown in flats are likely to have a more dense growth of roots than will those grown from direct sowings in the soil of frames. This gives them an advantage when transplanted, for there will be less shock and retardation due to the moving. When sowings are made directly in the soil of coldframes, or in open ground seedbeds, it is usual to space the seedling rows about 4 inches apart, the rows of course running across the beds. A 4-inch spacing allows room for use of a weeder between the rows and gives space for quick good growth of the seedlings.

Actual sowing of seed may be from the corner of an envelope, shaking or tapping the envelope gently to give even



Author photo

Author and bed of gentians one year from seed; lath shades, right, protect new beds from strong sun

flow. The more experienced gardener is likely to use only his fingers.

The main thing is not to sow too thickly or cover too deeply; the right depth is a case of gauging and balancing soil, seed, season and weather. For most seeds in good friable soil a depth of three times the diameter of the seed will work out about right. The best way to open rows is by the use of a planting stick, a thin narrow board or a lath, sharpened on one edge, and pressed into the soil to open a furrow of even depth. Be sure the row is well firmed down after sowing so the soil particles will be in direct contact with the seeds.

Germination and Care

Don't be too impatient about germination. Remember certain seeds will come up quickly and strongly within a few days after sowing, but others may require several weeks, a few kinds even months, before germination should be expected. In general, the kinds that like cool soil conditions, and so require early sowing, will take longer by their natures than will those upon which late spring or summer sowing is suggested.

Watering of an open ground seed bed is not often necessary, so far as early

sowings are concerned, but should there be a spring drought, then watering must be done—the kind that really soaks the dry upper layers of the soil down far enough so that contact is made with the under soil which is still naturally moist, and of course the watering must be done carefully enough so that the soil is not washed away. A surface wetting will not do.

Early-sown beds will require shading only in years of exceptionally quick hot spring weather, but summer sowings will usually be the better for a bit of shade. A lath screen placed a foot or more above the bed is perhaps most effective, a screen with spaces between the laths equal to their own width. Single layers of burlap or even of heavy cheese cloth tacked to frames are also sometimes used for seed-bed shading. The function of the shade is to temper the heat of the sun, thus cooling the soil a bit. Shade also helps to conserve moisture. When the seedlings are once well established and have struck out with a good root system, the shading may well be removed. During any considerable period of cold, cloudy or rainy weather, either before or after germination, take off all shades. Shades left on during that kind of weather are likely to increase damage from molds, fungi, or bacterial rots, and they may give conditions favorable to growth of moss. Scanty germination of seeds is likely in any bed that is once mossed over.

Keep the seedbed free of weeds. Catch the weeds when they are small, and do the catching often. Don't let weeds steal fertility, moisture and space that your seedlings need.

Time of Sowing

Sowing perennial seeds of different kinds can be pretty much a continuous operation throughout the year, with perhaps the exception of the period from late September into early November. By the middle of November sowings of the kinds that definitely require a long period of low soil temperatures may begin, this

continuing throughout the winter and into early spring with those that need only a shorter low soil temperature. In May and early June one may still sow aquilegia, allium, armeria, chrysopsis, hardy geranium and even liatris, gentian and the easier primulas, and along with these the very many additional kinds for which late spring is, in the year of average weather, the ideal sowing season. Try late spring sowing for alyssum, arabis, aubrieta, polemonium, erodium, asclepias, baptisia, thermopsis, callirhoe, potentilla, anthericum, tradescantia, cassia, cerastium, thalictrum, viola, elsholtzia, geum, mertensia, gillenia, isatis, silene, lysimachia and lythrum. Though May (and early June) is their preferred sowing season, most of them may still be sown in summer with good results providing attention is paid to shading. There they join the rather large group of perennials that quite definitely desire summer sowing.

Here are the names of a few perennials with which summer sowing is advisable, or at least possible: campanula, hibiscus, amsonia, veronica, hypericum, anchusa, stokesia, rudbeckia, hardy salvia, hardy centaurea, digitalis, platycodon, delphinium, gypsophila, hardy helianthus, heliopsis, nepeta, lychnis, helianthemum, myositis, hemerocallis, coreopsis, malva, lobelia, glaucium, patrinia, dianthus and the hardy poppies.

Transplanting and Mulching

Perennials sown in early or late spring will be large enough for transplanting to their more or less permanent positions by early autumn, but they can remain in the seedbed without damage until the following spring. Large perennials may be moved with good results until quite late in autumn, but first-year seedlings that have not as yet made deep roots should be transplanted early enough so that there will still be a few weeks of good growing weather before the ground freezes to root depth.

You can have summer damage, too. This happens when plants are moved too



Author photo

Bleedingheart (*Dicentra spectabilis*) grows readily from seed

early while the days are still hot. Don't be bound by dates in this, or in any other garden operation. Rather, judge by the weather of the individual season in your particular area in planning your work.

When late autumn comes and the ground begins to freeze, it is wise insurance to protect any beds still containing seedling perennials with a generous mulching of straw, salt hay, corn stalks, evergreen boughs, or other coarse litter that will not mat down. The object of this protection is to keep the ground frozen, and so prevent destruction of seedlings by heaving. It is alternate freezing and thawing that does damage with young plants that have not yet struck down strong anchoring roots below the frost line.

Perennials with relatively large smooth short roots are the ones most likely to be injured by winter heaving. This includes platycodon, eremurus, hibiscus, scutellaria, callirhoe and aquilegia, with others. All these are fully winter hardy when once established and beyond the seedling stage. Loose mulchings that will catch the snow are most likely to be satisfactory; leaves of poplars, buttonwood and tulip-tree (*Liriodendron*) are less likely to cause damage than are those of oak or maple. Remember that any kind of winter mulch protection will do harm if it be left on in spring after new growth has started.

WHEN TO CALL THE TREE DOCTOR

No "surgery" needed with timely care

Alex Laurie

Condensed from *The Home Garden*,
April, 1949

THERE are many first-aid measures that any able-bodied gardener can apply to his ailing trees. But there are times when the doctor should be called. If he is a good doctor, he may give only advice. That in itself may be invaluable. There are also certain remedies which only professional skill can cope with. In either case, his judgment will be useful.

One of the most spectacular phases of tree care is the filling of cavities, yet actually it constitutes a very small portion of the work of the "tree doctor." The prominence enjoyed by this calling is due partly to exploitation on the part of some professionals or pseudo-professionals, and partly on the reaction of the general public to the intriguing notion that such tree treatment is akin to a major operation by a surgeon or dentist. There is no doubt that the filling and treatment of a large wound in a tree needs expert knowledge, so it becomes paradoxical to find that the public will permit any fly-by-night operator to work on valuable trees and yet would be aghast at allowing any sawbones to operate on its own body.

Origin of Wounds

Wounds and subsequent cavities in trees originate with neglected bark injuries. If these are recognized and corrected in the early stages, decay will not develop. If it does, however, before any attempt is made to fill decayed cavities, consideration should be given to several factors. In the first place, is the tree

valuable enough to warrant such treatment? If it happens to be a tree of doubtful beauty with undesirable qualities, exemplified by the Chinese Elm, Catalpa, Box-elder, most of the soft Maples, Willows, Poplars, and others of the same character, the advisability of expensive treatment involved in making a filling is questionable. A replacement would be in order, which in a comparatively short time will be more satisfactory than the old patched-up tree and may cost no more.

The second factor to consider is improvement of the appearance of the tree by filling a cavity. Undoubtedly, the filling of a large opening will enhance the appearance of the tree and may add to the pride of ownership. A much more important factor in tree repair is the excavation of the decayed portion and with it the elimination of insect-ridden wood and a breeding place for various pests, diseases or even rodents. It should be noted in this connection that a complete cure is extremely difficult except in cases of small and shallow cavities. Much labor and actual laboratory examination of wood would be required before any assurance that all decay-producing organisms have been removed or killed. As a consequence many expert operators are inclined to remove all the decay and matter, within reason, treat the cavity, and *leave it open*. This not only reduces the cost of filling, but enables the operator to observe and remove further decay later on.

Although it is true that the presence of a cavity weakens the tree structurally, it does not necessarily follow that a filling will lend it strength. Fillings placed high above the ground may actually cause greater damage from extreme wind storms than open cavities with proper bracing.

Copyright, 1949, The American Garden Guild, Inc., 444 Madison Avenue, New York, N. Y.

Unfortunately many a tree owner is assured that a cure-all will be effected by tree filling and that greater strength and longevity will thereby result. Actually many of the trees so treated may live a shorter time than those which were merely cleaned and disinfected. Furthermore, extensive removal of all wood containing infected tissue may so weaken the tree as to make it dangerous to structures and passers-by.

If a decision is reached to call in a tree man, it is highly important to realize that unless you get a first-class one your investment may well yield dividends of headaches rather than satisfactions.

Beware

First, beware of fly-by-night operators, tree butchers, tree dentists, and the magicians who by means of injections of fluids and the waving of wands claim to control disease and prevent insect infestation. They are legion, sometimes equipped with superficial information and pseudo-scientific lingo, and frequently with nothing but gall. Employ only a good and experienced man, and see to it that he is able to present genuine "credentials" such as a tree repair license from the State, names of customers with whom you can check the quality of his work, charges, and so on. Be suspicious of any evasiveness, extravagant claims, bargain price offers and the like. A really good tree surgeon, arborist, expert or whatever he calls himself has nothing to conceal. You'll have to pay well for his services, but it will be money well spent.

The cleaning of the cavity comes first, and is done with chisels or gouges, removing as much decayed wood as is consistent with the vigor and structure of the tree. The inside of the cavity should be so shaped as to eliminate water pockets. If pockets have to be left, drains should be attached. The shaping of the mouth of the cavity is particularly important. Healing will take place only if the bark

and the cambium below are healthy, and sufficient thickness of sapwood is left to prevent dripping. Along the sides the opening should be parallel to the flow of sap and both top and bottom should be tapering and not cut squarely across. In many cases, bracing and bolting become necessary to insure strength. Upon completion of this mechanical phase, all cut surfaces should be sterilized carefully to insure against reinfection. Then a good tree paint is applied.

Filler Material

The choice of materials for filling cavities depends on the operator you select, but despite his favoring one material against another you should appreciate what constitutes a good filler. First and foremost the material should be durable, so that it will not crack under stress, break down because of temperature or moisture changes, nor contain ingredients injurious to the tree. It should be flexible enough to conform to the shape of the cavity and at the same time to become a sufficiently integral part of the tree to adhere without cracking off.

Concrete is the most common filler and when laid with expansion joints, properly painted and thoroughly braced on the inside (and, sometimes, reinforced with steel rods), it is satisfactory, though not ideal. Asphalt mixtures, wood blocks, and other special fillers are used by various arborists.

Supports

One of the less understood but very essential operations of a tree surgeon is bracing to supply artificial support to weak or injured trees. Tough-fibered trees like Oak, Beech, Locust and others rarely need any artificial support. Most of the coniferous evergreens rarely require it because of their single stems and type of branching. Elms, Maples, Ash and others often are benefited by proper supports, which really provide a form of insurance for greater longevity of the

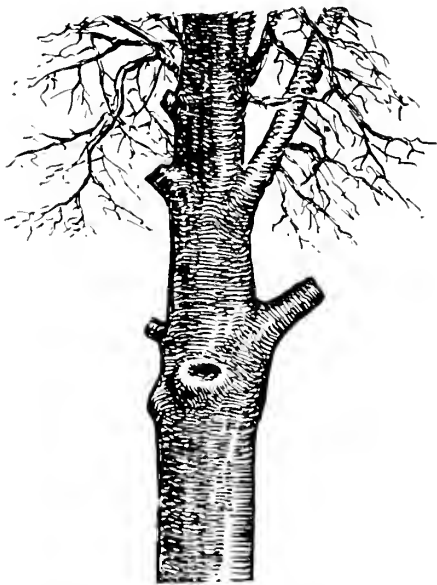
tree. Actually, knowledge of the breakage liability of any species under consideration is necessary for a wise decision on the use of supporting devices.

Artificial supports prevent splitting of crotches and reduce damage to branches weakened by injuries or decay. The old style iron collars, inflexible rods and dangling chains are not only inefficient but often harmful. For long cracks, weak or splitting branches and for cavity work, bolts or threaded rods are best, whereas wire cable is used for the support of weakened branches and reduction of load. An expert tree surgeon or arborist can readily determine the kind of braces needed and the system to use. A *direct brace* supports by cable two branches arising from a single crotch. A *box* is the attachment of cables to large limbs in a rotary manner forming a box effect. A *hub* or *spoke* cabling radiates from a central limb to the outer ones, or the place of the center stem may be taken by a steel ring. A *triangular* system calls for

cables placed in various types of triangles. The last named is probably the most efficient and satisfactory of all.

Pruning

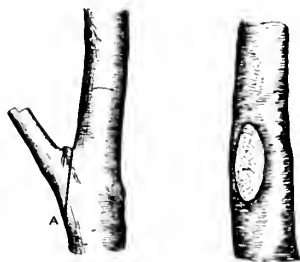
Of all the tree maintenance problems, that of pruning is given the least attention and is often placed in the hands of the least experienced persons. As a matter of fact, proper pruning and subsequent treatment of wounds is the best prevention for decay and enables the tree to withstand adverse conditions more readily. Cuts on limbs should be made as close to the trunk as possible to avoid stubs. This will facilitate healing and reduce danger of decay from constantly exposed wood which cannot be covered by new growth and bark. The split wood and bark frequently seen below a cut is due to lack of knowledge of pruning. The same must be said of the failures to paint the wounds quickly and thoroughly and keep them painted until a callus has covered them completely.



Improper pruning with stubs remaining and wound cavity developing at scar in center of trunk



Proper method of pruning large branches
Upper left—partial cut on lower side. Upper right—cut on upper side. Lower left—final cut at A so as to leave no stub. Lower right—face view of clean cut ready for tree paint



A SKY GARDEN GROWS IN BROOKLYN

12 Stories up, would make an expert proud

J. W. Johnston

Condensed from *New York Herald Tribune, Garden Page*, July 17, 1949

AFTER some seven years of trial and error, Mr. and Mrs. Jacob H. Schaeffer, of 41 Eastern Parkway, Brooklyn, have come up with the finest roof garden planting this writer has ever seen, and that includes quite a few sky gardens.

With the exception of a bit of advice from the fine veteran horticulturist, Montague Free, which incidentally was not too encouraging, this is strictly an amateur job. Starting with pots and tubs and fighting wind and sun, the Schaeffers soon worked out their project.

A combination five-foot wall and split fence on the southern exposure of both east and south terraces breaks the hot sun and aids in wind control, a real problem on the roof of a twelve-story building. Additional solutions have been worked out such as two glass windbreaks along the south terrace which, though



Penthouse walk with tuberous begonias in shallow bed at left; numerous annuals in deeper bed at right. Boston Ivy on the wall



Why leave the city in summer with a roof garden like this?

11.607

they do not obstruct the view, stop winds from attaining a too-high momentum.

On the northeast corner, back of an imposing clump of golden privet hedge, the same arrangement has been used which lets the light in but effectively stops murderous winds.

This is the first roof planting on which I have ever seen roses grown to their best with varieties such as Peace, New Dawn and Pink Radiance in fine and full flower. As if this in itself were not a sufficient achievement, one encounters a series of beds planted with tuberous begonias on the south terrace, protected by the five-foot wall and blooming freely. A bit further along are several beds of well grown gladiolus.

The list of plant material reads like a cross section from a fine nursery and seed

catalog. There are no trees. Height and accent are attained with fine specimens of golden privet; petunias, both double and single, are used, and zinnias, fibrous begonias as well as tuberous, nasturtiums both in beds and incidental pots, and cosmos, lilies (including auratum, rubrum and speciosum), shasta daisy, phlox, carnations and pinks. Coleus, delphinium, taxus, snapdragon, alysum, lantana, vinca, rose geranium and fuchsia and many others.

A little gem planted on the north side of the east terrace is the hardy silk tree (*Albizia julibrissin rosea*), a gift of the neighboring Brooklyn Botanic Garden of which the Schaeffers are contributing members.

The Schaeffer garden really came into its own when Mr. Schaeffer decided the



Woven cedar fence helps create a garden atmosphere and protects against wind

11,608

entire affair was potbound and, with his own hands, constructed the brick retaining walls some thirty inches deep to keep the plants alive and healthy. Then the formidable total of five tons of soil was transported bag by bag by elevator from the street.

Each spring the soil is revitalized by the addition of organic matter, manures and plant food. Other than that it stays as is, so that the initial expense was the real cost of the garden. Upkeep is at a minimum, unless you care to ring the time clock on a labor of love.

The east terrace is comfortably furnished with wrought iron and cypress furniture, and here is the scene of much outdoor dining, including steak broils. Mrs. Schaeffer says there is not much need of going any place, as most of her friends seem quite happy to visit this Brooklyn sky garden.

If any horticultural society has a stray medal lying around they want to put to good use, I recommend the Schaeffer garden as the finest candidate I have ever seen in a rooftop planting.



GARDENING WITH POTS OUT-OF-DOORS

Helen M. Fox

Condensed from *Journal of The New York Botanical Garden*, April, 1949

THE gardens of Spain, Italy, and China have always been primarily pot gardens. With few exceptions they were small so it was easy to furnish them with enough potted plants to be effective in the patios and courtyards, on stairways and terraces or standing on wide balconies where they formed attractive pictures and provided color and interest.

Along the Mediterranean and in other lands where summers are hot and dry, the ground parches and sometimes bakes. Gardeners in these countries, down through the ages, have found that it requires far less water to keep the soil moist in a few pots than in a sizeable garden of ornamentals.

There are many situations in our own land either without soil or with very poor soil where pot gardening would be a highly satisfactory way of growing plants—as, for example, in city squares, roof gardens, public parks, around bandstands, fountains, along the sides of steps, or bordering an entrance walk and in city back yards. Moreover these places have space for only a few plants and to get the best effect from them they ought to be blooming all season. Such uninterrupted bloom is much easier to provide with pot plants than when plants are rooted in the ground.

An essential adjunct for growing plants in pots is a place such as a cool cellar, greenhouse, or sun-heated pit in which to winter the half-hardy specimens—the jasmines, oleanders, and lemon verbenas. Also there has to be either a garden room or greenhouse in which to root cuttings in order to keep up the supply of geraniums, fuchsias, begonias, and other reliable treasures.

In selecting pots it is most satisfactory to keep all the containers in harmonious shapes and colors. Pots come from many lands. The handsomest to my taste are the Chinese. They are frequently shaped like low bowls; sometimes they are high and wide with vertical sides, and they always have huge holes in their bottoms. They are either in the solid colors made famous in Chinese pottery—jade, green, eggplant, eggshell, or the blues called china or porcelain blue, or they are embellished with carvings of birds and flowers or with sayings from the Chinese poets. Next in beauty are Sicilian pots. These pots are sometimes high and round with flaring lips, sometimes clay imitations of low wicker baskets which are fine for weeping plants, or again in other shapes. Mostly they are of a natural roseate tan clay and without any glaze.

Before putting the soil in a pot it is important to place a few pieces of broken clay over the hole in the bottom in order to keep the drainage from being too swift. The soil varies somewhat, containing more or less sand, humus or rotted manure in its make-up, according to the requirements of the plants. On the average, the soil mixture consists of one-third rotted cow manure, one-third rotted compost or thoroughly rotted leafmold, and one-third sandy loam, with several handfuls of sand added to each pailful of the mixture. Fuchsias have done very well for me in a composition of half rotted leaves and half rotted manure with no soil or sand.

Some gardeners put bonemeal in their mixture but where the plant is at home in acid soil, it might be better to use one of the general fertilizers such as 5-10-5. I do not fertilize with chemicals until the plant has become established in the pot. I then give only small quantities once a week, provided the aim is to keep



Gottsched-Schleisner

Author's terrace bordered with potted plants in flower

the plants in the pot garden flowering and lush-looking without forcing them to a larger size. Another necessary practice is to prune the plants to keep them bushy and prevent them from being leggy.

Potted plants should be placed far enough away from a wall to cast a shadow on the terrace or the ground, and far enough from each other to allow plenty of space for branching out. When the groups consist of a few plants only, three, five, or seven are easier to arrange than even numbers of pots. Also, the heights of the plants should vary, with tall plants in the background. A few plants with glossy foliage such as laurel or sweet olive or even a camellia or gardenia form a pleasant contrast to plants with dull-surfaced leaves such as rosemaries or geraniums. The effect of solid leaves, too, is softened by interspersing a few feather-leaved geraniums or cut-leaved lavenders. The colors in

the flowers depend on the gardener's taste and there is no limit to the many possibilities.

To look well in pots, plants must have a shape that is suitable to be lifted high off the ground and the adaptability to grow well in a confined place. They should be ramblly or misty, but should be compact and preferably leafy, with either conspicuous flowers or unusual foliage.

Anyone can have a pot garden composed of annuals and half-hardy plants. Certain combinations have become almost hackneyed, they have been used so frequently, but are charming nevertheless. Such combinations are white marguerites and red geraniums; pale gold and orange calendulas with purple petunias and blue ageratums; begonias with heliotrope; forget-me-nots and pansies. Carnations do well in pots and so do sweet williams, which can be planted with violets. Other plants which thrive in pots are chrysan-



Chinese pots and pedestals at approach to grassy terrace in author's garden

Walter Beebe Wilder

themums, cinerarias, and some of the tall tuberous-rooted plants such as *Agapanthus* and such fleshy-rooted subjects as atamasco lilies (*Zephyranthes*) and varieties of *Zygadenus*. Less well known for pots but highly satisfactory are polyantha roses. For background plants there are oleanders with white, pink, red and even salmon-colored flowers. Orange or lemon trees or bushes of gardenias add to the picture, and so does a *Tibouchina* with its stunning purple blooms.

Each gardener selects the plants he prefers and those which do best in his situation. I have gone in principally for fragrant plants, beginning with those which are not hardy out-of-doors in winter. As a side issue there are fuchsias, oleanders, and begonias, which last are the best of all house plants for me. The geraniums—or rather pelargoniums—constitute the mainstay of the pot population. Some of these are plants with large and beautifully colored flowers, others are varieties with highly colored foliage. There are a few varieties of the weeping forms and also plants of the Lady Washington strain. The bulk of the collection consists of plants with leaves having special fragrances, such as those smelling of mint and shaped like ivy, foliage fra-

grant of lemon with tiny crumpled leaves, another form with slightly larger leaves, others smelling of apple, nutmeg, orange and balm.

The principal herbs that I grow are lemon verbena, rosemary, and sweet bay, as well as two lavenders, *Lavandula dentata*, which makes a handsome shrubby plant, and *L. abrotanoides*, not as easy to keep and somewhat sprawly. There are several superb salvias among my pot plants, such as *Salvia Greggii*, with exquisitely shaped crimson blooms; *S. microphylla*, with blossoms of true scarlet; *S. Clevelandii*, marvellously fragrant, and the strongly scented pineapple sage. Then too there are bushes of jasmine which with pots of tuberoses furnish delicious fragrance for late summer and on into Thanksgiving.

The flowering plants are removed from the terrace when their bloom is over, unless their foliage is decorative, and they are then replaced with others. In winter the half-hardy population gives way to evergreens in wooden tubs, since pots of clay or concrete crack.

Thus, not only all through the growing season, but from fall to spring, there is interest and variety among the potted plants outdoors.

WHAT MAKES A PLANT REALLY HARDY?

*Many factors control hardiness—
in addition to inherent vigor*

Montague Free

Condensed from *The Home Garden*,
March, 1949

IN addition to the degree of inherent hardiness possessed by trees, shrubs, or herbaceous plants, there are a number of other factors which singly or in combination may determine whether they will be alive and vigorous, injured and weakly, or dead after a winter outdoors. Among these factors are: the character of the soil; sub-surface drainage; air drainage; the nature of the climate; weather during the growing season; placement with respect to the points of the compass; exposure to wind and sun; fluctuations of winter temperature; snow or its absence; the time of transplanting; and the age of the individual plant.

Soil

Lush, soft shoots are more subject to winter injury than those which are firm and well ripened. Sappy growth may ensue when plants are set in an overly rich soil with ample supplies of moisture. Henry Teuscher, curator of the Montreal Botanical Garden, cites the behavior of Beauty-bush, which is perfectly hardy on the Gaspé Peninsula "in thoroughly drained, poor, stony soil in a location with free air circulation; but it often suffers winter damage in the vicinity of New York (1,000 miles farther south) if planted in rich, moist soil in a sheltered spot."

Don't plant in too rich a soil to begin with. Avoid overfertilization and over-watering after midsummer. (Hybrid Tea Roses, for example, should not be

fed after the beginning of August.) If growth seems too lush towards the close of the growing season, it may be hardened by planting Rye or something similar to take up excess nitrogen and moisture. Give maximum sun and free air circulation.

Sub-Surface Drainage

Except for those plants which grow in nature in a waterlogged soil, free under-drainage is essential for winter survival.

Air Drainage

Cold air, being heavier than warm air, flows into low spots, creating a hazard for our not-quite-hardy plants and for those which grow late in the fall or make an early spring start. *Avoid poorly drained spots and saucer-like depressions for plants of dubious hardiness and also for late-bloomers sensitive to frost, such as Chrysanthemums and Dahlias. Chrysanthemums are less likely to be injured by early frosts if planted where they are shaded from morning sun.*

Climate and Weather

I was once given some Century Plants collected from a location in Arizona subject to sub-zero temperatures and was told that because of this they would surely be hardy in the vicinity of New York. They were planted, grew satisfactorily until the fall, but were defunct the following spring in spite of a mild winter with no sub-zero temperatures. The probable explanation is that the sap was too watery to withstand even a mild winter. *Such plants should be set in rather poor, dry soil in the sunniest, windiest position available.*

Rose of Sharon, which is on the borderline of hardiness in many parts of Eng-

Copyright, 1949, The American Garden Guild, Inc., 444 Madison Avenue, New York, N. Y.

land, is hardy in America in a belt running from Massachusetts westward through Ohio and Missouri, a zone having a winter climate more severe than that of England but also greater summer heat, which promotes hardening and ripening of the tissues. *Such plants should be set in sunny, exposed situations.*

Some years ago, when the late Sir Arthur Hill (then the director of Kew Gardens) was visiting the Brooklyn Botanic Garden, he was amazed to learn that the East Indian Lotus (*Nelumbium uclumbo*), growing rampantly in the lake there, was left outdoors the year round. He thought it might be a hardy strain and asked for propagating stock to try outdoors at Kew, where it was customary to grow *Nelumbium* in a tropical greenhouse. The following spring, with the aid of a leaky boat and potato-hooks, we managed with great effort to haul out a dozen tubers from the mud beneath 3 or 4 feet of water and sent them to Kew where, I am told, they succumbed. It was *not* an especially hardy strain. *A hot, sunny spot is needed by Nelumbium and water deep enough to prevent tubers from freezing.*

Climate and Weather During Growing Season

When there is an abundant supply of moisture in the ground during late summer and early fall, woody plants may suffer from low temperatures because of the watery condition of the cell sap. We are rightly advised not to allow evergreens to go into the winter dry at the roots, but one eminent *Rhododendron* grower believes the advice has resulted in injury to many *Rhododendron* plantings because the owners have applied water *too soon*, resulting in the condition mentioned above. *Keep plants well watered (if necessary) until late summer, then let nature take its course. If the soil is dry as winter approaches, give it a good soaking after there has been enough cold weather to cause dormancy to set in.*

Exposure

Aspect, exposure to winter sun and wind, and fluctuations of temperature are more or less linked in affecting the hardiness of plants. I once had two plantings of *Euonymus Fortunei coloratus*, a reasonably hardy evergreen in the cold belt that takes in Massachusetts, western Pennsylvania, Ohio, and Missouri. One of these was situated on the south side of a dry stone wall, on which it climbed; the other, not more than 50 feet away, was in the open, near the foot of a slight north-facing slope, and sprawled on the ground. The planting sheltered from the north by the wall was killed to the ground; that in the open was unharmed. Two factors may have operated to cause injury to the seemingly well-sheltered plants: (1) exposure of the leaves to sun striking at almost a right angle caused loss of moisture which the inactive roots were unable to replenish; (2) the "warm" location, which accentuated normal temperature variations throughout the winter, resulted in much alternation of freezing and thawing (and possibly prevented the plants from becoming thoroughly dormant) so that they were susceptible to low temperatures.

It seems that many plants can endure low temperatures if they are thoroughly dormant, but a few weeks of warm weather followed by a cold, windy spell may be disastrous. This is especially true if it happens towards the close of winter when plants come out of their dormant condition with very little encouragement. Some years ago, here in the Northeast, many well-established *Rhododendron* plantings were killed to the ground as a result of several days of strong, cold winds in late winter which came after a mild spell had induced a certain amount of internal activity.

Gradual Exposure

It is believed that if plants are gradually exposed to cold they are more resistant (probably because they have op-



Snow can be a winter protector for low-growing shrubs

portunity to increase their sugar content). About twelve years ago in these parts the onset of winter was very sudden, accompanied by what we non-rugged easterners call a blizzard. It started on Thanksgiving Day, and the following morning the temperature was down to zero. When spring came, the injury to all but the hardiest evergreens was tremendous and was attributed to the low temperature accompanied by high winds at a time when vegetation was not completely dormant.

Dry winds and sun in late winter often are injurious to tender evergreens in exposed situations. *We cannot entirely circumvent climatic and weather conditions but we can ameliorate them to some extent by planting evergreens on a north-facing slope where there is shade from morning sun or where shade from winter sun is cast by tall trees or buildings. This will minimize fluctuations in soil and air temperature and help to keep plants dormant throughout the winter. A permanent windbreak 20 to 100 feet from the plants or a temporary one near at hand is desirable. A mulch of leaves or litter on the soil is helpful by preventing deep freezing.*

Although the warmest spot in the garden is often not best for woody plants it is excellent for some of the nearly hardy bulbs. The Belladonna-lily (*Amaryllis belladonna* or *Callicore rosca*) and some of the Crinums probably could survive the winter in a fairly severe climate if planted at the foot of a south-facing rock or, better still, near the south wall of a

heated greenhouse or dwelling where the soil would be prevented from freezing deeply by heat transferred through the wall. Mulching would be desirable in the fall after dormancy begins.

Snow

Deep snow is an effective aid in preventing winter damage to herbaceous plants and low-growing shrubs if it comes early and stays late, but it sometimes causes breakage of branches by its weight. *Mulching with light, littery material or with evergreen boughs is a substitute for snow. Avoid planting breakable plants (or plan to protect them) where they would be exposed to snow sliding from the roof.*

There are some species which are less hardy in infancy than when they have a few years of growth back of them. Among these are Azaleas; young evergreens in general; the Dove Tree; Sequoia; Kousa Dogwood; and Rose of Sharon. *Preferably, three- to five-year stock of these should be planted in the spring rather than in the fall. If babies must be planted, they should be protected during their tender years.*

Finally, it is good general policy, when dealing with plants that are not quite hardy, to plant them either in the spring or early in the fall, taking special care to transfer them with as little root injury as possible. They will then overcome the shock of transplanting before they have to endure the hardships of winter and will be better fitted to survive.

THE PLACE OF SMALL

Gardening offers its own rewards

Condensed from *Bulletin* of the Garden Club of America, May, 1949

IT might seem presumptuous to speak of small gardens in *your* life, when I know nothing about your lives. However, since you and I are living under the same national and economic circumstances, living in the same uncertain and confused world, your life in respect to gardens and gardening is probably no different from mine. By glancing at what is going on here and in England, we may be able to chart our own course for the future.

Gardens and gardening are sensitive indices to economic and governmental conditions and changes. Living and gardens expand or contract with them. In the days when a man could keep all his profits, the owners of great fortunes were inclined to make and maintain great estates. Under the socialistic government

of England and its nationally accepted deprivations, no one can longer afford to maintain an extensive estate garden. So a National Trust has been formed to choose and preserve a few of the more notable.

Will we ever come to that? Only the wilfully blind can fail to realize the increasing paternalism in our government. This must be supported by higher and more taxes. They inevitably spell the death of the big estate garden. They are closing the purses of those men and women who once could afford to be patrons of gardening, patrons of plant-hunting expeditions and all such expensive horticultural efforts.

Big estates are being cut up for housing developments and of those that remain, the owners can no longer afford to maintain greenhouses and the necessary staffs to prepare and set up exhibits.

Copyright, 1949, The Garden Club of America.

Richard Averill Smith



A
small
rose
garden

GARDENS IN YOUR LIFE

By RICHARDSON WRIGHT

When people criticize our flower shows for having become so commercial, having a preponderance of exhibits by commercial nurseries and seedsmen, the answer is that if we didn't have them, there would be no show.

At first glance this might seem a bleak outlook. However, we have in this country a more democratic approach to horticulture—the garden clubs. In England, where the Royal Horticultural Society is the premier organization, the fact remains that more than half its members live within a radius of forty miles of London. I dare say that the membership of the three great horticultural societies on the Atlantic seaboard—Massachusetts, New York and Pennsylvania—would have the same ratio of nearby resident members. At the same time, spread throughout the country is this vast network of garden clubs, literally thousands of them with memberships of several

hundred thousand. Even the newest comer—the Men's Garden Club—has rolled up an amazing membership.

* * *

From now on you and I are going to cultivate smaller gardens. We may have to abandon much that we once maintained. On our place in Connecticut, where garden laborers ask \$12 a day, more and more parts of it are being abandoned. Even with mechanical help, less and less lawn area can be maintained, fewer and fewer edges kept neat and trim. Doubtless the Wright tombstones will have for inscription the words, "They bit off more than they could chew."

As we adjust our lives to reduced budgets, so we must adjust our gardens. In the future you and I will be thinking and gardening in smaller terms. But there will be more people gardening. It is far better that there be millions of small gar-

Richard Averill Smith

A
small
suburban
backyard
garden



dens in this country than just a few thousand swept and garnished estates behind high walls and fences.

It follows, then, that the most important subject our garden clubs can study is the small garden. By a small garden I mean any terrain from a backyard to the topmost limit of, say, three acres. Your study will follow certain lines: (1) design and scale; (2) the maintenance of the productive health of the land, and (3) what you are going to plant in it.

But before we embark on these we have to ask ourselves some forthright questions: (1) What kind of person are we—formal or informal, or modern? (2) How much are we really interested in gardening? (3) To what extent have we magpie-like acquisitive minds? Let's try to answer those questions.

(1) A garden should be a personal expression. It will be an expression of your personality if you do the planning yourself, or have definite ideas to hand the professional landscape architect who will work out the details.

As I go among gardens I see them as the expressions of minds that are formal or informal. Perhaps we might say that the thoroughly well-balanced gardener prefers some of each. Part of the garden will be mathematically formal, part consciously informal. We all have some wild spots in us that let nature take her course.

(2) The second question is: to what extent are we really interested in gardening? What are the conflicting interests we must abandon if we are going to make the act of gardening become, as I believe it can, an essential part of a good life?

Just being terribly busy in running a garden club is no evidence of interest in the act of gardening. Those of us who go around the country talking to these clubs have found it the better part of wisdom never to ask to see the garden of the club president.

If your varied interests prohibit your doing much of your own garden work,

plant only those things that require little work—the shrub border instead of the perennial flower border, wide seasonal bulb plantings, more areas paved around the house; limit the area of lawn to be cut, or cut only that near the house and let the rest grow up. Select only those plants that require a minimum of exacting attention.

(3) My third question is: to what extent are you a collector? Being a collector by nature, I am never satisfied with having one example of each variety. I should have been satisfied with the seven lilacs I bought when I first started my garden. Not content with those seven, the lilac collection has grown to over 100 named varieties and all the species and species variations that will thrive in our climate. Only last fall I surreptitiously set out two new varieties.

Being of that kind of gardening mind, I enjoy it in others.

And yet, unless the small gardens that will be our lot in the future fall into a dead sameness, we must plant and cultivate something more than the general run of common and easy plants. Since we will be working in a relatively restricted area, we will be required to exercise discriminating judgment on what goes into it.

Down South the spread of camellia gardens containing the newest varieties is a sign that gardeners in that area are becoming more discerning of good and unusual plant material. The way that orchid growing has passed from the hands of the very rich to the ardent attention of the little man with a 9 x 12 greenhouse is another evidence of experiment and discerning. The collector of old roses is a third indication that modern gardeners have acquired a sales resistance to the adjectival allure of every new hybrid tea put on the market. We gardeners are beginning to think for ourselves.

I spoke of the necessity for applying the principles of good design and scale to the small garden. Of these two, I think



Simple planting along a path

Richard Averill Smith



Richard Azerill Smith

Small terrace garden helps create charming setting

scale is the more important. The designing of a small garden follows the same principles as the furnishing of a small room. Place one large piece of furniture in a small room and it will throw the whole out of scale. No one thing should dominate. If the garden pool is too large or the flower border too big, it can well throw the whole place out of balance.

Scale is one of the hardest principles to teach. It involves the use of mental and visual discipline.

Some of us work too hard and too long in our gardens. We plant more than we intend to. We are so busy gardening that we seldom see our gardens. I have found it a wise counsel to drop deliberately some exacting job and stroll leisurely around the place.

If you get out of the wrong side of bed, try digging up a piece of ground. The rhythm of thrust, lift and throw will soon dispel your frustrations.

Solitary weeding affords a good chance for meditation; yes, even religious meditation. The purely mechanical work of the hands leaves the mind free to wander beyond the run of the world to touch and handle things unseen. I recall once having a long row to clean up and chose to do it by trowel instead of a hoe or cultivator. Had I used them and done the job in short order I should never have found the answer to one of St. Paul's puzzling paradoxes: "As having nothing and yet making many rich." May I suggest a semi-baked hour of solitary weeding as a solution for insistent problems?

MAPLE—THE MYSTERY TREE

William Gilman

Condensed from *Nature Magazine* for
March, 1949

FORTY-FIVE years ago, when Vermont was already noted as the nation's leading producer of maple syrup and sugar, the State's exhibit at the St. Louis Exposition showed the source of nectar for the great American pancake.

That exhibit was shown toward the end of a flurry of scientific interest, a half-century ago, in the whys and wherefores of flowing sap.

Science has even found a heroine in the form of a New Hampshire maple, quickly christened "Sweet Sue." For no outward reason at all, nine per cent of Sue's sap is sugar. That is three times sweeter than the average for a sugar maple, and it is hoped that ways can be found to populate the Northeast with lots of little Sues, because the ordinary maple tree is falling tragically behind in its economic fight for survival.

Aside from the characteristic flavor that makes its concentrated product so tasty, maple sap is distinguished by its leadership in sugar content. This varies from one type of maple to another, and it is *Acer saccharum*, commonly known as the "hard" or "sugar" maple, that is literally the sweetheart of the family.

The "soft" or "red" maple is tapped to a lesser extent because its sap is not so sugary. The black maple's sap will generally match the hard maple's, but it grows only in selected localities.

The conservationist can well use the maple as an Exhibit A in his plea that the woodsman spare the tree; that he consider it a crop to be harvested carefully rather than slaughtered recklessly. When other service is over, the tree provides valuable firewood and lumber. Before that, it offers beauty and shade, and fires that heart-warming spectacle, a New England autumn.

The trend is clear. A few years ago, Vermonters normally tapped five million trees yearly. The number is now down to three million. These trees were mainly inherited, and the new generation, while cutting, is not replacing them. Intelligent conservationists know that merely preaching at the farmer is futile.

One answer would be maples with higher sugar content. The sugar maple today is exactly as she was when the Indians found her. Maize and tobacco were also Indian discoveries, but agricultural science has enormously magnified their yields. In fact, the maple is unique, agriculturally speaking, in the total lack of genetic improvement it has received. That is why research has begun in the State universities of Vermont and New Hampshire. The projects are backed by experiment station funds, also by Nature enthusiasts and practical businessmen who do not want their source of maple sugar to dry up.

The boiling will be done in the old-fashioned way. Steaming "sugar house" and bubbling evaporator have not changed much in fifty years. The syrup-maker discards the steam and wants what remains in the evaporator.

There were hopes of speeding up the process by boiling in a vacuum. Results seemed splendid. Boiling went quicker, and at a lower temperature. The product had the pale-straw color of fanciest-grade syrup. But it was almost tasteless. The maple "bouquet" was absent. When the liquid was transferred to an ordinary kettle, and underwent slower heating at higher temperature, it turned out to be delicious. The short cut had apparently prevented caramelization, which, along with the sap's native mapleine, is necessary for full flavor. Thus, unless and until better methods develop, syrup-making will remain a tedious process of slowly boiling off between 30 and 45



An old maple tree may be tapped in several places

Eleanor Gilman

drops of water for every drop of remaining syrup.

It is in the tree itself, therefore, that the scientists are concentrating their search for greater efficiency. Armed with refractometers, which instantly record the sugar content in a drop of sap, New Hampshire scientists sought throughout the State for abnormally sweet trees. And they found Sue, the champion, right on their own horticultural farm, just off the university campus.

Was it environment or heredity that made Sue so sweet? They are still trying to decide the answer. If it is environment, Dr. Clark L. Stevens, head of the forestry department, offers a choice of two conjectures, based on the fact that

Sue is one of six trees in a row, and all are abnormally sweet. She stands beside what has probably been a barnyard ever since she sprouted, and one of the tests that Dr. Stevens is making with her seedlings will determine the effect of fertilizers upon sap richness. But Sue also stands over a rocky formation, and this revives a long-held theory that sweeter sap is related to stony soil, which reflects more of the sun's heat to warm the tree in spring. The seeds from Sue that Dr. Stevens planted four years ago are now youngsters a foot high, and he plans to start sap tests on them this spring, but warns it is far too early to determine whether they will be as sweet as their mother.

Like other maple scientists, Dr. Stevens is handicapped by the nature of his specimens. The maple grows so slowly that a genetics experiment with it can cover the life spans of several men. And Dr. Stuart Dunn, plant physiologist, and the other member of the New Hampshire team, reveals another reason why results must be slow in coming. Maple seeds sprout easily. But such reproduction has limited value for testing purposes. Due to random cross-pollination, the exact parentage of the seedlings is uncertain.

Grafting is touchy, layering useless. Cuttings are the best method, and Sue's lower boughs are robbed yearly for these specimens. But, unlike cuttings from the easily propagated poplar or willow, maples root reluctantly. And then they decline to leaf out the next spring. However, his many disappointments have not discouraged Dr. Dunn, and he is now able to root cuttings fairly easily under white fluorescent light, with high hopes of making them grow after that in humus taken from a maple grove.

The ultimate goal is to give farmers pedigreed maple trees with sap as rich as, or richer than, Sweet Sue's. Then it would be possible to plant sugar orchards whose trees would be as superior to ordinary maples as nursery apple trees are to wild ones.

At the University of Vermont, the research program has two main phases occupying the attention of Dr. James W. Marvin, and Dr. F. H. Taylor.

The latter has been propagating seedlings and cuttings in order to build up uniform stocks for comparison purposes. These, and native maples on the experimental farm, will undergo many tests. One tree will be tried with fertilizer, another without; one in a swamp, another uphill, and so on. Obviously, this is only the beginning of a long-term project.

Dr. Marvin is boring into the tree itself to answer the old riddles about sap flow, taking over where the University chemist, C. H. Jones, left off a half-

century ago when science had less research behind it and cruder instruments to work with.

There were not many questions that Mr. Jones overlooked in his quest. He established techniques by which sap bacteria could be controlled and the quality of syrup thereby improved. To determine the breathing surface of a sample tree, he began calculating and counting. The answer was 162,500 leaves, which, he said, covered "in round figures, a third of an acre."

Using an ordinary steam gauge, he recorded as much as 25 pounds pressure at the tap-hole after noon, and suction during the night when the tree tried to suck back its sap. Everyone "knows" that sap runs up a tree from the roots, but Mr. Jones proved it is not so—at least, during the sugary flow of spring. He recorded twice as much pressure downward as upward. As a matter of fact, he finally concluded it was not really a flow in either direction, but rather an oozing toward the tap-hole. The chemist called it an internal bleeding that went on inside the tree every spring as part of its awakening process after winter's dormancy.

Dr. Marvin has gone in more deeply, exploring his hunch that the flow is caused by intra-cellular changes affected by osmosis and heat variations. By insulating a tree, he has raised its temperature at will, electrically, and made sap flow on order, proving that heat rather than light decrees when spring sap will run.

In a full-dress experiment four years ago, Dr. Stevens got sap from branches, logs, posts, and trees standing upside down in tubs of water. Dr. Marvin has put this freakishness to practical use. He runs sap tests throughout the year, simply by cutting young maples in sugaring season, keeping them in laboratory cold storage and thawing them out when he wants to tap in some unheard of month like July or November.

CARNIVOROUS PLANTS

*Plants that round out their diet by
"eating" insects*

Walter Hendricks Hodge

Condensed from *Natural History*, June, 1949

INSECTS that eat plants are common enough; but plants that eat insects are freaks perhaps unsurpassed in interest by anything else in the green world. Yet such plants are not uncommon throughout the world from the arctic to the tropics. Plants of this sort are called carnivorous or insectivorous.

These green insect-eaters are sedentary and thus, unlike roving animals, are unable to run after and catch their prey. But they have evolved some of the most sensitive snares, diabolical traps, and wells-of-death imaginable. In fact, their leafy parts have at times become so modified that they no longer possess sufficient chlorophyll for normal food synthesis. Instead, their leaves serve as bait and are colored with attractive hues of red or purple. They are so bizarrely modified that they might be mistaken for flowers. Furthermore, these plants are so independent of the normal sources of nitrates

Copyright, 1949, American Museum of Natural History, New York 24, N. Y.



Entire plant of Venus Fly-Trap (*Dionaea muscipula*)

Author photos

that they are able to inhabit extremely poor soils. About all they need from the substratum is water. Some are wholly aquatic, such as the majority of bladder-worts; but most of them must be sought in bogs or marshes, where their weak root systems, acting merely as water pipes, are often buried in nothing more than wet mats of moss.

The Sundews

Of all the carnivorous assemblage the sundews, belonging to the genus *Drosera*, are the most wide-spread, the most numerous, and apparently the most successful. The little sundew, because of its size, is not well known by Mr. Average Man. Yet on most every sphagnous bog, near many a spring rill, and even on many a high Andean mountainside, it spreads its expectant whorls of tiny, frequently spoon-shaped leaves. Woe betide any dipterous biplane that sails unwarily into its glistening leafy orbs, for it is soon ensnared in viscid blobs of glue, nature's original flypaper. Charles Darwin, whose researches on insectivorous plants are classical reading, considered the leaf of *Drosera* one of the most "incredible and wonderful" things known to him in the whole field of botany.

From the upper surface and edges of these leaves arise several hundred green or purplish hairs, sometimes called "tentacles," which serve as the traps for insects. On the central part of the leaf the tentacles are short and stubby, but as one progresses to the margins they become much longer. Each hair is club-like at its tip, the swelling being a tiny oval gland. When functioning properly, each tiny hair produces sticky drops of a fluid that glistens in the sunlight, giving to the leaf as a whole the appearance of an elfin crown studded with dozens of shining diamonds.

The gnat that flops into this sparkling orb is hopelessly ensnared by this living vegetable flypaper—a green octopus, whose tentacles begin a characteristic

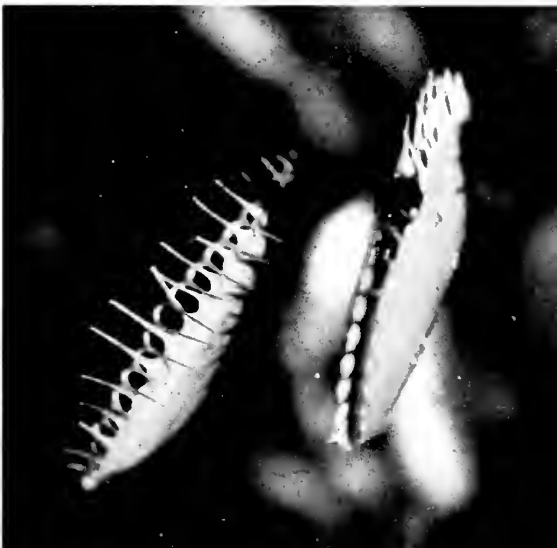


An inquisitive ant wanders over the dangerous area of the Venus Fly-Trap leaf blade

slow, bending action. This brings the hair tips as well as their trapped prey into the center of the leaf, until the leaf looks like the inflexed fingers of a clenched hand. The hairs, with their glands, effectually contact, hold, and digest the insect morsel, and remain in this position until digestion is effected.

The leaf is now acting for all the world like an animal stomach. In the temporary enclosure formed by the hairs, the glands discharge a digestive juice possessing all the properties of pepsin, the ferment produced by our own stomachs. This ferment will digest any nitrogenous insect material. After several

Leaf closes quickly and the ant has little chance to escape from this curious botanical "stomach"





The commonest American Pitcher-Plant
(*Sarracenia purpurca*)

days the tentacles again expand, and the trap is ready to repeat the process.

When we remember that plants have no muscular or nervous tissue, the whole procedure seems remarkable. The force of the wind or drops of rain cause no reaction, and so the plant is spared expenditure of useless energy; but let food in the form of an insect alight and the glands react. Thus there is apparently both a mechanical and chemical reaction.

Venus-Flytrap

Although *Drosera* is the largest genus of a family (Droseraceae) boasting over 100 species in the temperate regions of both the Northern and Southern Hemispheres, there are other genera equally interesting. One is a plant that has devised not the flypaper technique but a clever mechanical trap. This plant is

the all-American Venus-Flytrap (*Dionaea muscipula*), found only on the Atlantic coastal plain, chiefly near Wilmington, North Carolina. This curious plant spreads its leafy rosettes like a bear trap and awaits whatever prey may appear. The leaves of Venus-Flytrap are more spectacular, larger, and much more rapid in action than *Drosera*'s apparatus. Furthermore, they show greater complexity of structure, for the functions performed by the tentacle alone in the sundew are discharged by three different structures in *Dionaea*.

Each flytrap leaf consists of two halves. These are held open at an angle of up to 80 degrees. The upper surface of the blade is often colored a beautiful red owing to the presence of multitudes of minute closely-packed short-stalked glands. Their purpose is purely secretive and digestive, although their brilliant color undoubtedly serves as an insect lure. Rising from the surface of each half of the leaf blade are usually three stiff hairs which act as ultra-sensitive triggers to set off the whole insect-catching mechanism. To complete the complex apparatus are a series of rigid marginal spines, which interlock like the teeth of a bear trap when the leaf is closed. These are not sensitive.

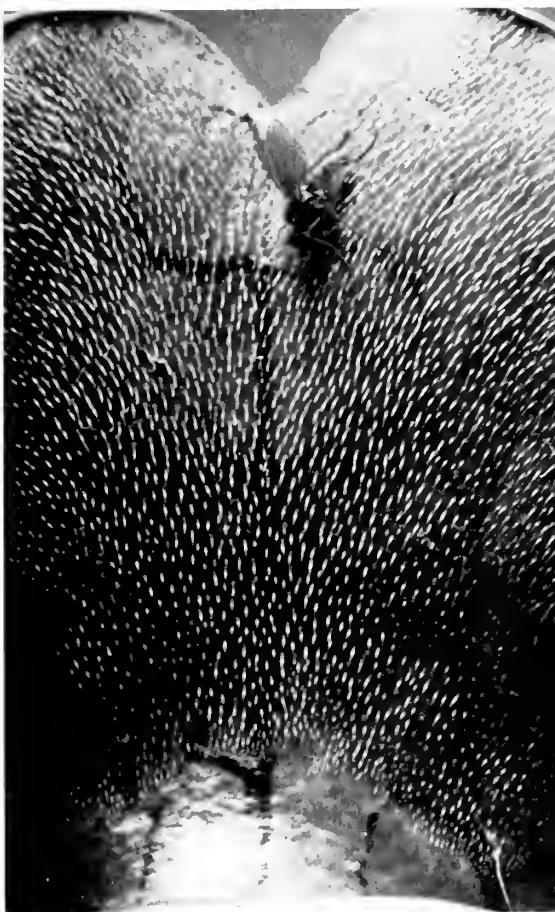
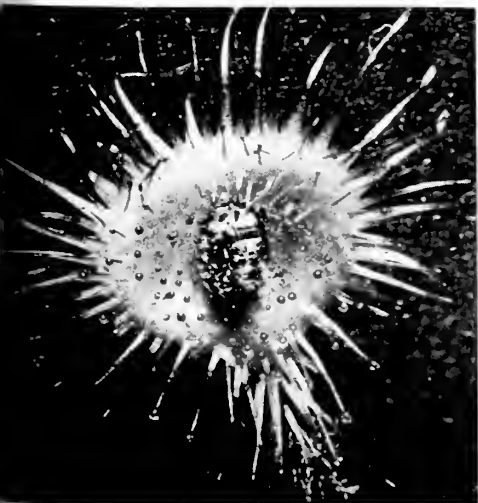
Dionaea is called a flytrap. Over the dangerous area of the blade wanders an inquisitive ant. It is usually safe so long as it doesn't brush against one of the up-right triggers. If it does, even though the touch be momentary and slight, zip!—and within a second or two the leaf-halves evenly and firmly close. The triggers, hinged at their bases, fold neatly flat against the leaf surfaces while the ant is firmly held. Its body fluids, if ruptured, provide a necessary incentive for the surface glands, which immediately begin pouring out digestive fluids, and *Dionaea*'s temporary leaf stomach thus goes into action. A week may be required for assimilation, after which the leaf reopens, ready for another "mouthful."

The Butterworts

Another type of meat-eating plant is the butterworts—various species of *Pinguicula* (Lentibulariaceae). These fraternize with the little sundews on moors, moist peat lands, and bogs; and on the eastern Carolina savannas. Butterworts also spread into mountainous terrain, where they may rear their small but colorful snapdragon-shaped flowers from wet rock crannies or springy places.

The tongue-shaped leaves of butterwort rosettes look superficially more like normal everyday plant leaves, yet the whole upper surface is peppered with tiny glands, roughly 25,000 per square centimeter of leaf surface. Any kind of pressure upon the glands by a foreign body causes them to secrete. If, in addition, the object happens to be nitrogenous, as in the case of an insect, they pour out quantities of mucilaginous and acid digestive liquid. The plant gets its common name from the fact that the leaf practically exudes "butter." *Pinguicula* also has a power of movement shown by its leaf margins. Although these exhibit a more or less permanent inrolling, the effect is increased when insects are stuck on the surface glands. By encompassing them with the margin, more secretive

Single leaf of Sundew (*Drosera rotundifolia*) with an insect caught on sticky surface



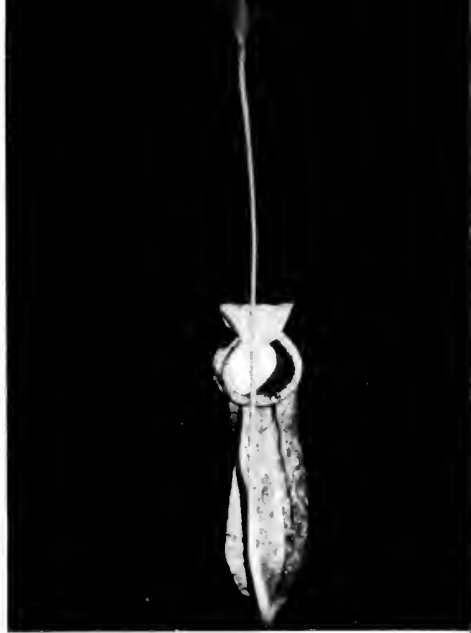
Inside of Pitcher-Plant showing hairs all pointing downward—preventing insect's escape

surface is put to work in digestion, and thus a more efficient type of temporary plant stomach comes into play.

Shepherds in the Alps have long used leaves of butterwort in curing the udder sores of milch cows. The glandular secretion of the blades apparently acts as an excellent antiseptic. And on a Lapland journey over 200 years ago, the great Swedish botanist, Linnaeus, noted that the inhabitants had observed that the secretion of *Pinguicula* glands acted similarly to rennet.

The Pitcher Plants

The all-American pitcher plants (*Sarraceniaceae*), familiar insectivorous plants common in bogs from the Gulf Coast to Labrador, have pioneered their own way of catching insects.



Tropical *Nepenthes* with giant-sized pitcher, the nectar flavored margin of which curls inward, thus trapping crawling insects

← Pitcher-Plant (*Sarracenia minor*) which lures with nectar; note transparencies in the hood

The numerous colloquial names applied to the species of *Sarracenia*—pitcher plant, sidesaddle flower, trumpet, huntsman's horn—aptly describe the hollow tubular leaves that serve this genus as insect traps. The leaves are attractive organs, often brilliantly colored with purplish-red reticulations or stripes on a green or yellow background. Not only do the leaves of these curious plants resemble flowers in shape and color, but they also mimic them in the possession of nectar glands. These exude fruity-smelling fluids of honey-like consistency, which entice the most reticent of insects from afar.

Suppose a fly catches sight of the leaf of the common pitcher plant, *Sarracenia purpurea*. It immediately attempts a landing, finding a beautiful plush-like "front porch," the hood, which serves as an admirable landing field. Heavenly odors (at least to an insect) exude from a portal near by. No job to walk toward it either, for all the hairs on the plant

door mat are bent thoughtfully that way! At this point the insect, having reached the sweet-smelling threshold, may be slightly punch-drunk and perhaps even staggering a wee bit on its six wobbly legs. A stumble is all that is now needed, and with it another insect is precipitated down the smoothest and most slippery shoot-the-chutes to be found in nature. At the dark bottom, the insect lands with a splash in water, foul smelling water, for this is a cistern choked with insect "soup." In many cases, the insect's wings become wet, eliminating its chances of flying out. Even if it reaches the sides, its doom is still sealed, for at the water level is another zone of long downward-directed hairs. The watery fluid exerts a quieting influence and stupefies the prey, for it contains protein-digesting enzymes secreted in quantity by glands on the bottom walls. Epidermal cells in the same region are constantly absorbing the nutrient solution resulting from decomposition and digestion.

In the job of wholesale insect slaughter



↑ California Pitcher-Plant (*Darlingtonia californica*) showing "Skylights" in the hood

Southern "Trumpets" (*Sarracenia*→*flava*), one of the many species of Pitcher-Plants



the *Sarracenia* is humane; it has been recently shown that this commonest of pitcher plants produces a powerful pain-killer. Ammonium extracts from the leaves have been used by Philadelphia physicians for over fifteen years as injections, and they are said to be superior to alcohol or novocain in at least three ways: anesthesia from *Sarracenia* extracts does not produce numbness, does not destroy nerve tissue, and is longer acting.

The leaves of the common pitcher plant are also pitfalls for ground-inhabiting insects, for its pitchers are often deeply sunk in masses of wet sphagnum moss. In such sites only the erect hoods remain unburied. These sunken pitchers are so open to the elements that they are generally full to the brim with rain water, which dilutes the consistency but apparently not the efficacy of the digestive fluid. In most of the other *Sarracenia*s, the hoods are not erect but bent over (like a jack-in-the-pulpit spathe), acting as capping protection.

The lesser pitcher plant (*S. minor*) of our southeast, with a helmeted cap and a baited path of nectar running from the ground to the orifice, surpasses all other species in insects captured.

This lesser pitcher plant and the California pitcher plant (*Darlingtonia californica*) have an interesting device for sealing the doom of insects that might be able to fly out of a fairly dry chamber. This is a "skylight" situated in the crown of the hood—actually a thin, transparent spot in the tissue of the leaf. An insect flying against the window in an effort to escape is, of course, only knocked down again into the well below.

During the recent war our fighters in the jungles of Malaya and South Pacific islands ran across the most bizarre of all pitcher plants, those of the oriental family, *Nepenthes*. *Nepenthes* is a climber with giant-sized pitchers, slung like so many Chinese lanterns at the ends of leaflike petioles, with honeyed margins to lure its prey to death pools within.

PROPAGATION BY HARDWOOD CUTTINGS

Quick and easy for the gardener

Roy M. Nordine

FOR propagation of woody plants by hardwood cuttings, the current season's growth is generally used, either the long canes that grew up from the base of the plant or the new growth on the ends of the branches. These canes may be gathered soon after the dormant season has begun, or any time until late winter. Material from plants that may be injured by severe winter weather should be gathered before temperatures have dropped.

Storage of Canes

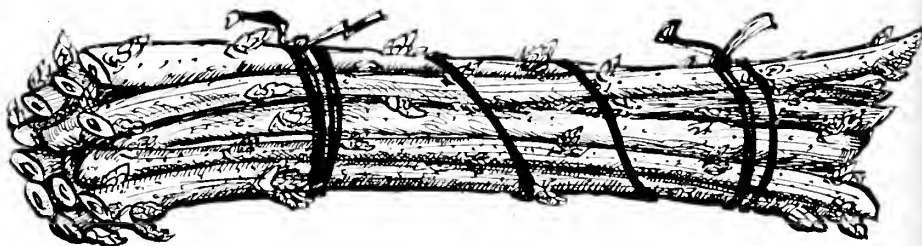
The canes may be made into cuttings at the time of gathering, or stored until later in a cool place, below 50° F.—even at freezing temperatures. It is not necessary to bury the wood, or to put the cut ends in moist material; but the canes should not at any time be subjected to drying conditions such as higher or fluctuating temperatures, drying winds, or any circumstance that may draw the moisture from them. It is equally important to prevent excessive moisture near the stored material. The ideal way to store the canes is to bury them in a generous

quantity of well-moistened material, such as peat, sand, wood shavings, sawdust, Sphagnum moss, or vermiculite.

Cuttings

Cuttings are usually 6 to 8 inches long, and can be made with a knife or with pruning shears. Cutting just below a node or bud is usually of no great importance; but plants with hollow stems or large spongy pith should be cut just below a node or bud. Cuts may be made either straight across or with a slight slant. The upper end of the cutting should be an inch or so above a bud, whenever possible. This prevents injury to the top bud, should the cutting become dry or die back; it also offers mechanical protection against injury at planting time. The diameter of the cutting is of no great importance, except that very thin wood and the late growth on the tips do not make cuttings that survive the storage time. The ideal cutting is of lead-pencil size, both in length and in thickness. Cuttings should be made so that they may have six to eight weeks of storage time before planting.

The finished cuttings are gathered into bundles of convenient size. Tap the bottom of the bundle on a flat surface to



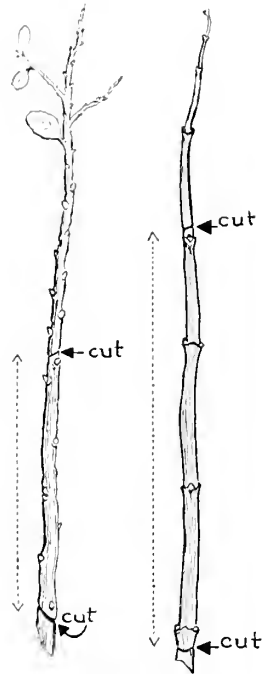
Bundle of hardwood cuttings ready to be stored in moist sphagnum, sand or vermiculite

level it, label it, and tie it with stout cord or fine wire. The bundles are then buried. They may be placed in either a horizontal or a vertical position. The storage temperature should be low, but above freezing; a range of 40° to 50° F. is ideal.

Planting

The cuttings should be placed in the ground as soon as the soil is workable. They may be set 9 inches apart, in rows 2 feet apart, and left for several years. Or they may be set 6 inches apart, in rows a foot apart, and removed after one season. If a hedge is planned, the cuttings may be set into their permanent location immediately. A tool should be used to make an opening in the ground just wide enough to take the cutting and deep enough to place the top bud at the soil surface. Firm the soil around the cutting.

The percentage of cuttings that grow will vary considerably, depending on many circumstances; but results of 80 per cent are excellent.



Diagrams to show how hardwood cuttings are taken from branches

Suitable Plants

Button-bush (*Cephalanthus*)
 Currant (*Ribes*): varieties with edible fruit
Deutzia
 Dogwood (*Cornus*), except the Flowering Dogwood
 Elderberry (*Sambucus*)
Euonymus: a few varieties
 Fig (*Ficus carica*)
 Golden-bells (*Forsythia*)
 Honeysuckle (*Lonicera*)
 Indian-currant (*Symphoricarpos orbiculatus*)
 Jasmine, or Jessamine (*Jasminum*)

Kerria
 Matrimony-vine (*Lycium*)
 Mock-orange (*Philadelphus*)
 Mulberry (*Morus*)
 Ninebark (*Physocarpus*)
 Persian Lilac (*Syringa persica*)
 Poplar (*Populus*)
 Privet (*Ligustrum*)
 St. Johnswort (*Hypericum*)
 Snowberry (*Symphoricarpos albus*)
 Spirea (*Spiraea*)
 Tamarisk (*Tamarix*)
Weigela
 Willow (*Salix*)

CARE OF GIFT PLANTS IN THE HOUSE

General suggestions, and directions for special cases

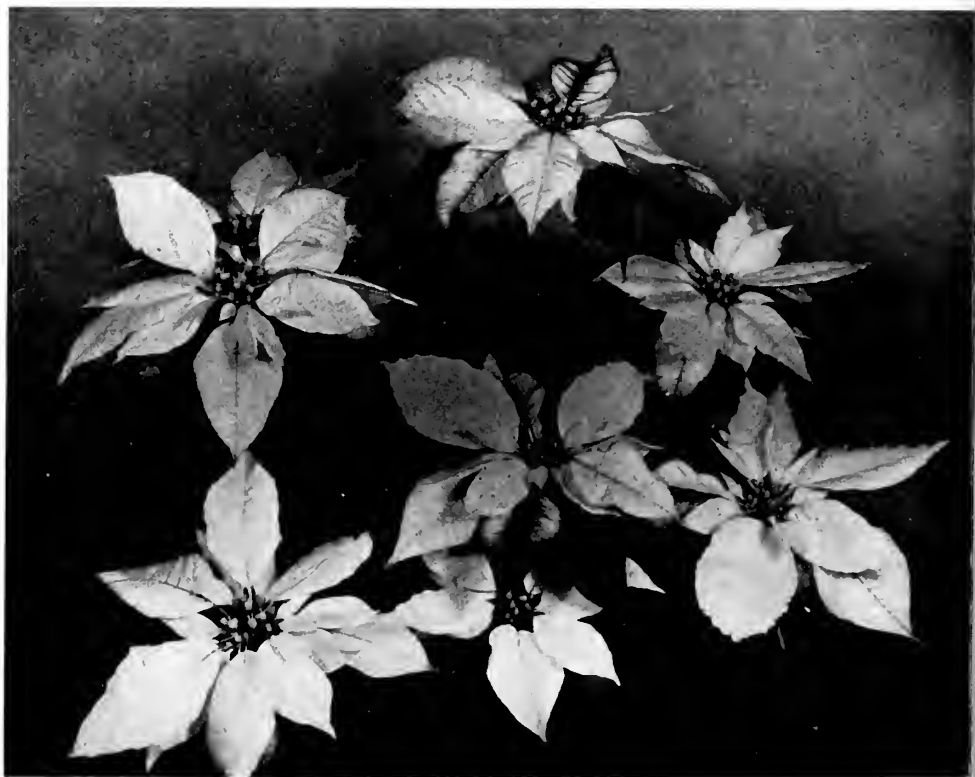
Alys Sutcliffe

WHEN we receive plants as gifts, we always want to keep them looking nice and full of flower for an indefinite period. This, of course, is almost impossible: unless we have a greenhouse or window garden, our plants are expected to live in conditions completely different from those in which they were raised.

Anyone who has visited the greenhouses of one of the larger commercial growers that supply the florist shops may

have noticed that every house has just one kind of plant growing in it. For instance, a house full of Cyclamens or Jerusalem Cherries (*Solanum Pseudo-Capsicum*) is kept at an even temperature of 50° to 55° F., as these plants need a cool atmosphere to bring them to perfection. Gardenia and Poinsettia are among the plants that need it slightly warmer. These two also need a high humidity, which is achieved by dampening the floors and benches in the greenhouse.

This is not to discourage the recipients of gift plants, but only to show why many plants die soon in the home if no special care is taken to make up for the big change in their surroundings.



White Poinsettia (*Euphorbia pulcherrima* var. *alba*)

Gottsch-Schleisner

Temperature

One of the difficulties to be overcome in the house is uneven temperature. Most people keep their rooms over 70° F. during the day; then, when the heat is turned off at night, the drop in temperature is very considerable, often over 20°. Flowering plants which have been accustomed to a steady temperature react badly to such fluctuations; but keeping them at a window during the day and moving them back in the room at night will help. During the winter, plants should not be near an open window; they "like" air, but not a draft.

Moisture

The air in the average house or apartment is said to be 4 or 5 per cent drier than the desert. Obviously, we cannot dampen the floors or walls; but trays of water on the radiators will help. Metal trays, or even window boxes, may be arranged with a layer of gravel or pebbles and water in the bottom. The plants, standing on the pebbles, are kept out of the water; but moisture is added to the air around them. Placing potted plants in window boxes with Sphagnum moss packed between helps to keep the soil from drying out too quickly. Care should be taken not to let the moss become so wet that the soil remains too wet all the time.

Watering is one of the most important things in the care of plants in the home; and the method of watering depends entirely on the type of plants and the conditions under which we are trying to grow them. Plants are much easier to grow in country homes—there is more moisture in the atmosphere, and less dirt, smoke, and fumes. In city houses and apartments it is really hard work, contending with all the things that flowering plants do not "like."

Individual Needs

The following are a few of the most popular gift plants, with their "likes" and "dislikes":



Gottsch-Schleisner

Jerusalem Cherry (*Solanum pseudo-capsicum*)

Poinsettias "like" high temperature, 70° F., and not lower than 60° F. at night. They should have as much humidity as can be provided, and the soil should never be allowed to dry out; but no plant "likes" to stand continually in water.

Gardenia is another warm-house plant; it "dislikes" sudden drops in temperature (which are likely to cause leaves as well as buds to fall); it also "prefers" high humidity and plenty of water.

Peperomia "appreciates" a warm, humid atmosphere, out of direct light; also careful watering from the bottom.

Cyclamen, which is very lovely when it first arrives, and too often dies quickly, "likes" to be really cool—not more than 50° F. (too cold for the average home). It should have plenty of water given by standing the plant in a pan of water for ten or fifteen minutes, then allowing the excess to drain off. A position at a light



A familiar Hydrangea

window, not near a radiator, may keep the plant growing for a few weeks.

Jerusalem Cherry "likes" a cool, light place, out of drafts, and plenty of water; it is also helped by having its leaves sprayed.

Kalanchoës are not so "temperamental" as some other plants, and normally will stand either heat or cold; but those sold for Christmas trade have been accustomed to a warm house, and it is well to keep them on the warm side. Splashing the leaves with water may spoil the foliage.

African-Violets (*Saintpaulia*), to be had the year round, cause heartaches over the same period. A few people manage to grow and flower them successfully, but

dozens have no luck at all; and those who succeed are never sure why. Many different methods of culture have been advised. The plants do not "like" direct sun—a north window seems to be best. They need a soil with plenty of humus, but well drained and watered from the bottom; but even on that not everybody agrees.

Hydrangeas are generally in full flower when received as gifts. They "like" plenty of light and water; in fact, they will probably take about a pint of water every day. They should be kept as cool as possible, but not freezing. The plants may be put out in the garden for the summer, then dug up and repotted in September, but left out of doors until after a few light frosts. When they are brought indoors, the Hydrangeas may be stored in the cellar until about the end of December; then they should be given light and water, to start growth.

Azaleas received as gifts, like most flowering plants, take a great deal of water and cool temperature. When they have finished flowering, they should be repotted and the pots sunk in the garden for the summer. The plants should be brought indoors before cold weather. Some varieties may be planted permanently in the garden.

Flowering bulbs received in pots are not of any use for future forcing. However, they may be kept in flower for a longer period if they are put in a light but not sunny window, kept cool, and given plenty of water. Narcissus and Hyacinth bulbs may be planted in the garden when they have finished flowering, and will flower there in a year or so.



Worth Reading

A SELECTED LIST OF RECENT NON-TECHNICAL BOOKS, MAGAZINE ARTICLES, AND
EXPERIMENT STATION BULLETINS FROM ALL SECTIONS OF THE COUNTRY

General

MANUAL OF CULTIVATED PLANTS, by L. H. Bailey and staff of Bailey Hortorium. Published by Macmillan Co., New York. 1949. 1116 pages. \$17.50.

Revised and greatly expanded edition. Indispensable for technically trained gardeners, horticulturists and botanists working with cultivated plants from ferns to compositae.

LIBERTY HYDE BAILEY, by Andrew Denny Rodgers III. Published by Princeton University Press, Princeton, N. J. 1949. 506 pages. \$7.50.

A story of American plant sciences and scientists as well as a splendid biography of Dr. Bailey.

IN GARDENS OF HAWAII, by Marie C. Neal. Published by the Bernice P. Bishop Museum, Honolulu. 1948. 805 pages. \$8.00.

A manual primarily about some 2,000 native and introduced ornamental and food plants; illustrations of nearly 600 species. For use by amateurs as a floral guide to Hawaii.

GARDENS IN THE MODERN LANDSCAPE, by Christopher Tunnard. Published by Charles Scribner's Sons, New York. 1949. 184 pages. \$5.00.

Historically reported and well illustrated; slanted towards the professional. Revised edition.

ORCHIDS ARE EASY TO GROW, by H. B. Logan and L. C. Cosper. Ziff-Davis Publishing Co., New York. 1949. 312 pages. \$6.00.

Orchid growing simplified for the amateur; a handy reference manual.

MEMOIRS OF A ROSE MAN, by J. Horace McFarland. Published by the Rodale Press, Emmaus, Pa. 1949. 144 pages. \$3.00. Dedictory letter by Liberty Hyde Bailey, introduction by R. C. Allen.

Random sketches, chiefly on roses—written in heart-warming style. The last of McFarland's important writings.

GARDEN FACTS AND FANCIES, by Alfred C. Hottes. Published by Dodd, Mead & Co., New York. 1949. 370 pages. \$4.00.

Random chapters on The Realm of Nature, The Garden's Answer to Our Quest for Happiness, Where Our Gardens Come From, Vegetables Have Their Stories Too, Trees—the Earth's Noblest Product, Garden Quips and Cranks, Individual Flower Legends, List of State and National Flowers, etc.



THE HANDBOOK FOR FLOWER SHOWS, edited by Esther C. Grayson. Published by the National Council of State Garden Clubs, Inc. Revised edition. New York. 1949. 129 pages. \$2.50.

HOW TO INCREASE PLANTS, by Alfred C. Hottes. Published by A. T. De La Mare Co., New York. 1949. 279 pages. \$3.00.

About seeds, cuttings and grafting, and answers to a host of questions of interest to the amateur. Well illustrated.

THE TWELVE SEASONS, by Joseph Wood Krutch. Published by William Sloan Associates, New York. 1949. 188 pages. \$3.00.

A series of personal reflections for the professed Nature lover, one for each month. Infinite variety—from microbe to moon.

THE JOYFUL GARDENER, by Agnes Rothery. Published by Dodd, Mead & Co., New York. 1949. 274 pages. \$4.00.

On garden enjoyment, a gay book of fact and fancy.

FIELDBOOK OF NATURAL HISTORY, by E. Laurence Palmer. Published by McGraw-Hill Book Co., New York. 1949. 664 pages. \$7.00.

For general reference and identification of plants, birds, fish, rocks, and minerals, stars, etc. For the naturalist rather than the gardener.

PLAY WITH PLANTS, by Millicent E. Selsam. Published by Wm. Morrow and Co., New York. 1949. 63 pages. \$2.00.

An elementary little book on experiments with plants, well illustrated with line drawings. Intended for junior readers and adults without house plant or gardening experience.

CITIES CAN HAVE GARDENS TOO, by Katherine M. P. Cloud. In *The American Home*, April, 1949. 2 pages.

A story of the possibilities of small city gardens, based on Philadelphia experiences.

Gardening and Landscaping

THE HOME BOOK OF TREES AND SHRUBS, by J. J. Levison. Published by Alfred A. Knopf, New York. 1949. 524 pages. \$10.00.

A complete guide to the design, planting and care of the home grounds; information on lawns, woodlands, identification of trees, etc. Second edition, completely revised and beautifully illustrated and printed.

HOW TO BEAUTIFY AND IMPROVE YOUR HOME GROUNDS, by Henry B. Aul. Published by Sheridan House, Inc., New York. 1949. 320 pages. \$3.50. Introduction by J. W. Johnston.

This book by the well-known Assistant Horticulture Editor of the New York Herald Tribune is one of the most useful and important contributions to home garden design in many a year.

SELECTING A BUILDING SITE FOR FARM, VILLAGE, OR CITY HOMES, by Donald J. Bushey. New York State College of Agriculture, Cornell University (Ithaca) Extension Bulletin 748, June, 1948. 14 pages.

Factors to be considered in choosing a site and location; helpful diagrams.

NO OFF-SEASONS IN THIS GARDEN; HOW TO HAVE A PERPETUAL FLOWER-SHOW WITH A MINIMUM OF WORK, by J. E. Howland. In *House Beautiful*, July, 1949. 3 pages.

How a California garden is kept in bloom and disease free by "planting" potted flowers.

ROCK WALLS BECOME GARDENS, by A. McCully. In *Better Homes & Gardens*, May, 1949. 1½ pages.

Suitable plants briefly listed with planting methods for harmonizing different wall types with your garden.

DO YOU KNOW HOW TO USE BROADLEAF EVERGREENS? by John Grant and Carol Grant. In *House Beautiful*, November, 1948.

Growing of shrubs for leaf characteristics. Zonal listing of bold, medium, fine textures.

THE MINIATURE ALPINE GARDEN, by Lawrence D. Hills. In *Bulletin of the American Rock Garden Society*, Nov.-Dec., 1948. 3 pages.

Build your own mountain in a dish or pan!

HOW TO PLANT A WALL GARDEN, by Montague Free. In *The Home Garden*, April, 1949. 10 pages.

Directions for construction, planning and planting.

THE PICTORIAL VALUE OF GROUND COVERS IN SHADE, by Francis C. Wilson. In *House Beautiful*, October, 1948.

Uses and general characteristics of nine plants, evergreen and deciduous.

TEUCRIUM, THE PERFECT EDGING PLANT, by M. W. Dunwell. In *House and Garden*, April, 1949. ½ page.

A description of this disease free, dark green, dependable perennial.

THE SECRET OF MAKING A GARDEN LOOK NATURAL, by John Grant and Carol Grant. In *House Beautiful*, March, 1949. 3½ pages.

How harmony of foliage color can help garden planning. Lists of plants according to climatic zones.

GROW PLANTS THAT CAN TAKE IT, by Hal Burton. In *Better Homes & Gardens*, June, 1949. 5 pages.

A selection of plants and instructions for planting in sand, clay, dry rocky soil, and on hillside or slope, based on the experiences of the Department of Parks in New York City.



Pest Plants and Their Control

POISON IVY AND ITS ERADICATION, by E. M. Stoddard. Connecticut Agricultural Experiment Station (New Haven) Circular 170, June, 1949. 4 pages.

Brief description of effectiveness of various means of eradication; chemical preparations listed.

USING 2,4-D SAFELY, by L. S. Evans, J. W. Mitchell and R. W. Reimen. United States Department of Agriculture (Washington, D. C.) Farmers' Bulletin No. 2005, November, 1948. 10 pages.

Effects of 2,4-D on animals and man, what it is, and how it kills plants.

Trees, Shrubs, and Vines

SHRUBS AND VINES FOR AMERICAN GARDENS, by Donald Wyman. Published by Macmillan Co., New York. 1949. 442 pages. \$7.50.

More than 3,000 different plants are evaluated of which the author recommends only a few over a thousand as worthy of planting. A "must" book on the shelf of everyone interested in ornamental horticulture, whether amateur or professional.

WOODY PLANTS OF THE WESTERN NATIONAL PARKS, by Virginia Long Bailey and Harold E. Bailey. Monograph No. 4 of the American Midland Naturalist, published by The University Press, Notre Dame, Indiana. 1949. 274 pages. \$4.00.

For the partly-trained amateur, and the professional botanist. Common as well as scientific names.

COLORADO EVERGREENS, by Robert E. More. Published by the Denver Museum of Natural History, Denver, Colorado. 1949. 89 pages. \$2.50 (\$1.50 in paper covers).

New edition, copiously illustrated, and containing a new chapter on the horticultural uses in Colorado of selected kinds of evergreens. The chapter on timberline trees is especially interesting, and attractively illustrated.

TREES: THE YEARBOOK OF AGRICULTURE, edited by Alfred Steferud. Published by the United States Government Printing Office, Washington, D. C. 1949. 944 pages. \$2.00.

Over one hundred articles on trees, trees and homes, forests, and knowing trees.

GREEN GLORY; THE FORESTS OF THE WORLD, by Richard St. Barbe Baker. Published by A. A. Wyn, Inc., New York. 1949. 253 pages. \$3.50.

Forests and forestry—a bird's-eye tour of the planet for everyone interested in its welfare.

RHODODENDRONS AND AZALEAS, for recent books on, see page 54, Spring issue of *PLANTS & GARDENS* for 1949.

BRITISH RHODODENDRONS—AMERICAN VIEWPOINT, by John Henny. In *Gardening Illustrated*, July, 1949. 2 pages.

Observations of many kinds and species of rhododendrons in Great Britain.

WINDBREAKS FOR ILLINOIS FARMSTEADS, by J. E. Davis. State of Illinois (Urbana) Natural History Survey Division, Circular 38 (3rd printing), February, 1949. 33 pages.

Planning, planting, description, and care of some suitable trees.



ROSE CULTURE IN CALIFORNIA, by H. M. Butterfield. University of California (Berkeley) Agricultural Extension Circular 148, November, 1948. 39 pages.

Discussion of popular varieties; their use and care.

THE WISTERIAS, by Donald Wyman. In *Arnoldia*, June 10, 1949. 12 pages.

Identification of species according to length of flower cluster, order of bloom, fragrance, and color.

LILACS, by Donald Wyman. In *Arnoldia*, May 6, 1949. 4 pages.

Lists the best lilacs of those on trial at the Arnold Arboretum.

IN PRAISE OF SOME OLDER HYBRID TEA ROSES, by R. E. Shepherd. In *Flower Grower*, June, 1949. 3 pages.

Many hybrid tea rose varieties are 10 to 50 years old, are still worth growing, and are show winners. Newness is not a mark of superiority.

TREE FEEDING, by August P. Beilmann. In *Missouri Botanical Garden Bulletin*, May, 1949. 7 pages.

Methods of feeding and dosage for trees of various sizes.

REDWOODS IN CHINA, by Ralph W. Chaney. In *Natural History*, December, 1948. 5 pages.

Relates the discovery of *Metasequoia*, the Dawn Redwood, a tree that was thought to be extinct (see also *PLANTS & GARDENS*, Winter number, 1948).

WINTER FLOWERING SHRUBS, by J. Coultts. In *Journal of the Royal Horticultural Society*, March, 1949. 8 pages.

Shrubs that flower from late October to March, some adapted to northeastern U. S., others in more temperate areas.

THE FORSYTHIAS, by Donald Wyman. In *The National Horticultural Magazine*, April, 1949. 14 pages with illustrations.

Description of species and varieties with a color comparison of bloom and simple key to identification.

JAPANESE SINGLE CAMELLIAS, by Kan Yashiroda. In *Horticulture*, June, 1949. 1 page.

First hand information from Japan, where, in the same latitude as New York City, there are small native forests of *Camellia japonica*.

FOR WINTER GAIETY, by Donald Wyman. In *Horticulture*, August, 1949. 1½ pages.

Shrubs and trees with colored bark, together with culture methods that encourage color development.

THE ORIENTAL CRAB APPLES, by Donald Wyman. In *Gardeners' Chronicle of America*, April, 1949. 3 pages.

Characteristics of growth, flowers, fruit and foliage which make the crab apples desirable ornamentals.

CHOOSE THE BEST OF THE JUNIPERS, by P. J. van Melle. In *The Home Garden*, January, 1949. 7 pages.

Junipers offer a great diversity of forms for all landscape purposes; tall narrow columns, pyramidal forms, spreading types or those suitable for ground cover.

ERNEST H. WILSON, PLANT HUNTER EXTRAORDINARY, by E. I. Farrington. In *Flower Grower*, May, 1949. Followed by "12 of Wilson's Best Shrubs," by P. J. van Melle. 4 pages.

False-Spirea (*Sorbaria arborca*); Korean Spirea (*Spiraea trichocarpa*); Beauty-bush (*Kolkwitzia amabilis*); Warty Barberry (*Berberis verruculosa*); Black Barberry (*Berberis gagnepainii*); Vernal Barberry (*Berberis vernac*); Manchurian Rhododendron (*Rhododendron micranthum*); Spreading Cotoneaster (*Cotoneaster divaricata*); Willowleaf Cotoneaster (*Cotoneaster salicifolia floccosa*); Redbead Cotoneaster (*Cotoneaster racemiflora*); Tea Crab Apple (*Malus hupehensis*); Chinese Neillia (*Neillia sinensis*).

Annuals, Perennials, and Bulbs

HOW TO GROW ANNUALS, by Ann Roe Robbins. Published by the Macmillan Co., New York. 1949. 300 pages. \$3.50.

Directions for growing twenty-five of the most popular annuals; also about their color range, height, length of bloom, etc.

CARNATIONS AND ALL DIANTHUS, by M. C. Allwood. Published by Allwood Bros., Hayward's Heath, Sussex. Third edition. 1949. 379 pages. 25s.

IRIS FOR EVERY GARDEN, by Sidney B. Mitchell. Published by M. Barrows Co., New York. 1949. 224 pages. \$3.00.

An iris handbook in every sense, by a well-known authority.

FAVORITE FLOWERS IN COLOR, by E. L. D. Seymour, and others. Published by Wise & Co., New York. 1949. 634 pages. \$4.95.

Illustrated with 300 colored pictures.

DAYLILIES IN FLORIDA, by John V. Watkins. University of Florida (Gainesville) Agricultural Extension Circular 88, March, 1949. 8 pages.

Description of suitable species and their culture in the South; history of Daylilies.

GROW DAYLILIES TO GET CONTINUOUS BLOOM, by E. F. Steffek. In *House Beautiful*, August, 1949. 2½ pages.

Mid-May to mid-August bloom; best varieties listed for each part of the country.

DO YOU KNOW THESE BALLOON FLOWERS, by C. W. Wood. In *Flower Grower*, May, 1949. 3 pages.

They are among the best of summer blooming perennials, with much bloom and a long life.

THE CHRISTMAS ROSE, by Mrs. Carl McNeilan Ballard. In *Arboretum Bulletin* (University of Washington), Winter, 1948. 2½ pages.

Legend, description, and culture of Helleborus.

WATER-LILIES, by George H. Pring. In *Missouri Botanical Garden Bulletin*, March, 1949. 28 pages.

Culture of tropical water-lilies including propagation, maintenance and care. Varietal lists according to color.

REDUCING GARDEN UPKEEP, by Paul A. Kohl. In *Missouri Botanical Garden Bulletin*, April, 1949. 4 pages.

Examples of plants requiring little care, perennials and evergreens.

THE BASIC PRINCIPLES OF NATURALIZING DAFFODILS, by James S. Jack. In *Flower Grower*, October, 1949. 4 pages.

Choose the correct variety and with good care and soil their beauty increases with the years.

THE GARDENERS' YEWES, by P. J. van Melle. In *The Home Garden*, June, 1949. 7 pages.

The Yew is a deserving landscape plant and valued for its rich, deep green foliage through summer and winter.

FOR AUTUMN CHARM, PLANT JAPANESE ANEMONE, by John G. Gallagher. In *Flower Grower*, March, 1949. 3 pages.

New varieties and old ones are easily grown with well-drained soil, light shade, and water.

AN EASY WAY TO PROPAGATE TRILLIUMS, by Walter E. Thwing. In *The Home Garden*, July, 1949. 7 pages.

Illustrated with pictures to show how it is done and the results to be expected.

GROWING TREE PEONIES, by Edward H. Blatter. In *Horticulture*, August, 1949. 1 page.

A dozen varieties and the author's experience with them in Illinois.

FAIREST LILY OF THEM ALL, by Jan de Graaff. In *Flower Grower*, August, 1949. 5 pages.

Lilium candidum, easy to grow, attractive in combination, is one of the most beautiful and useful of lilies.

SAGES FOR THE GARDEN, by Helen M. Fox. In *The National Horticultural Magazine*, July, 1949. 12 pages with illustrations.

Many useful for both ornamental and culinary purposes.

'MUMS FROM JULY TILL FROST, by Huston Porter. In *Flower Grower*, February, 1949. 6 pages.

How to plant; winter protection; feeding and staking; Cascade varieties.

House Plants

THE TRICK OF GROWING HOUSE PLANTS IN EVERY WINDOW, by Sophia Naumburg. Published by Floral Art, West Englewood, N. J. 1949. \$2.00.

A "loose-leaf" book of 80 pages—the right plants for the right windows. Reference charts for care of gift plants, and control of house plant pests.

GROWING BEGONIAS IN THE HOME, by Louis J. Kuester. In *The Begonian*, October, 1948. 3½ pages.

Analysis of the author's experiences and directions for culture.

THE BROMELIADS, BIZARRE, BEAUTIFUL, EASY TO GROW, by Milford and Racine Foster. In *The Home Garden*, September, 1949. 7 pages.

The culture of Bromeliads, one of the best of the house plants, requiring little care.



MORE ABOUT AFRICAN VIOLETS, by B. Y. Morrison. In *The National Horticultural Magazine*, October, 1948. 15 pages with illustrations.

A history of their introduction and development, together with cultural information.

ACHIMENES—PRELIMINARY NOTES, by B. Y. Morrison. In *The National Horticultural Magazine*, January, 1949. 22 pages with illustrations.

Historical and cultural information on a little known but very satisfactory house plant.

Soil

THE VALUE OF ORGANIC MATTER IN GARDENING, by Gustav A. L. Mehlquist. In *Missouri Botanical Garden Bulletin*, June, 1949. 5 pages.

Meaning of the term; value physically, chemically, biologically; how obtained by composting.

MAKE FRIENDS WITH YOUR LAND, by Leonard Wickenden. Published by The Devin-Adair Co., New York. 1949. 132 pages. \$2.50.

Argues for organic farming. Interesting reading; many conclusions are based on little evidence.

HUMUS AND THE FARMER, by Friend Sykes. Published by the Rodale Press, Emmaus, Pa. 1949. 392 pages. \$4.50.

Book promotes idea of organic farming and non-use of chemical fertilizers.



STONE MULCHING IN THE GARDEN, by J. I. Rodale, in collaboration with others. Published by the Rodale Press, Emmaus, Pa. 1949. 164 pages. \$3.00.

A collection of letters and essays—rock mulches, earthworms, hedgerows.

CHIPS ON THE LAND, by Robert A. Schraek and Russell Albright. In *American Forests*, May, 1949. 3 pages.

A portable machine converts slash to wood chips suitable for mulch or fertilizer.

Wild Flowers

AMERICAN WILD FLOWERS, by Harold N. Moldenke. Published by D. Van Nostrand Co., New York. 1949. 453 pages. \$6.95.

For the wild flower enthusiast a valuable new reference work which covers some 2,000 different kinds, with numerous illustrations.

YES—YOU CAN GROW FRINGED GENTIANs, by Walter E. Thwing. In *The Home Garden*, March, 1949. 7 pages.

Gives pictures showing necessary culture.

SOME ALASKA WILD FLOWERS, by Sarah V. Coombs. In *Gardeners' Chronicle of America*, May, 1949. 2 pages.

Descriptions of summer flowers throughout Alaska.

TAMING THE WILD FLOWERS, by Virginia G. Southwell. In *Gardeners' Chronicle of America*, June, 1949. 2½ pages.

Methods of providing natural situations for these plants.



ROADSIDE WILD FLOWERS, SHRUBS AND TREES OF THE U. S., by Kathryn Taylor. Published by Farrar, Straus and Co., New York. 1949. 182 pages. \$3.00.

A traveler's guide. In the first part are over 700 pictures for easy identification; part two lists dates of bloom by states. A useful book.

Lawns

HOW GOOD LAWNS GROW, by H. G. M. Jacobson, E. M. Stoddard and J. C. Schread. Connecticut Agricultural Experiment Station (New Haven) Circular 169, June, 1949. 19 pages.

Comprehensive discussion of problems of lawn care including soil conditions, seeding, upkeep, weed control, injuries and diseases, lawn pests and their control.

SPRING CARE OF ESTABLISHED LAWNS, by G. H. Ahlgren and R. E. Engel. New Jersey Agricultural Experiment Station (New Brunswick) Circular 524, March, 1949. 4 pages.

Brief explanation of methods to use.

SUMMER CARE OF THE LAWN, by G. H. Ahlgren and R. E. Engel. New Jersey Agricultural Experiment Station (New Brunswick) Circular 525, March, 1949. 4 pages.

Brief do's and don'ts of summer care.



HOW TO START A LIFETIME LAWN, by F. F. Rockwell. In *The Home Garden*, September, 1949. 6 pages.

Soil preparation, grading, good seed, and care make a permanent lawn.

CUTTING SO MUCH GRASS, by E. S. Harrold. In *Horticulture*, August, 1949. 1 page.

Creeping, sprawling plants and other ground covers suggested in place of grass. Followed by "Try This, if You're Tired of Poor Grass," by Allen H. Wood, Jr. In *Horticulture*, September, 1949. Tells of the use of *Veronica filiformis*.

Calendars and Diaries

THE FLOWER ARRANGEMENT CALENDAR (for 1950), by Helen Van Pelt Wilson. Published by M. Barrows and Co., New York. 1949. \$1.00.

An engagement calendar illustrated with a flower arrangement for each week in the year.

THE GARDEN WORKBOOK AND DIARY, compiled and edited by Wellesley-in-Nassau, N. Y., for the 75th Anniversary Fund of Wellesley College. Published by Doubleday and Co., Garden City, N. Y. 1949. \$2.50.

A calendar, or diary, as you wish.

Diseases and Pests



CHINCH BUG CONTROL IN LAWNS, by J. C. Schread. Connecticut Agricultural Experiment Station (New Haven) Circular 168, May, 1949. 6 pages.

Description, life history and control by Chlordane, D.D.T. and Sabadilla dust.

RIDDING THE GARDEN OF COMMON PESTS, by A. E. Michelbacher and E. O. Essig. University of California (Berkeley) Agricultural Extension Circular 146, October, 1948. 39 pages.

Descriptions and pictures of chewing and sucking insects; a few suggestions for their control; common diseases discussed.

OAK WILT—A SERIOUS DISEASE IN IOWA, by S. M. Dietz and Roy A. Young. Iowa State College (Ames) Agricultural Experiment Station Bulletin P91, July, 1948. 19 pages.

Symptoms, cause, control of this important disease of oak trees. 28 species tested, all found susceptible. Lists diseases confused with wilt.

CONTROLLING THE JAPANESE BEETLE. United States Department of Agriculture (Washington, D. C.) Farmers' Bulletin No. 2004, January, 1949. 14 pages.

Life history, distribution; control of beetle and grubs.

Shade-loving Plants

PLANTS FOR GARDENS IN THE SHADE, published by Mackwood Gardens, Spring Grove, Illinois. 54 pages. \$1.00.

Lists plants for light and dense shade, together with planting plans.



Fruits and Vegetables

GROWING STRAWBERRIES IN THE HOME GARDEN, by Richard E. Baker. University of California (Berkeley) Agricultural Extension Circular 151, May, 1949. 15 pages.

Characteristics of strawberry varieties and description of minimum requirements of soil, water, and sunlight. Strawberry barrel illustrated.

FOR FUN AND FRUIT, by Paul W. Dempsey. In *Horticulture*, August, 1949. Ways of making a strawberry barrel.

OUR VEGETABLE TRAVELERS, by Victor R. Boswell. In *National Geographic Magazine*, August, 1949. 73 pages with illustrations.

A story of the origin, nature, behavior, and travels of the vegetables now most commonly grown in the United States.

HOME VEGETABLE GARDENING, by John H. MacGillivray. University of California (Berkeley) Agricultural Extension Circular 26, revised November, 1948. 31 pages.

General rules for gardening from plan making to proper care of tools; description of individual vegetables. Well illustrated.

VEGETABLE CROPS, by Homer C. Thompson. Published by the McGraw-Hill Book Co., New York. 1949. 611 pages. \$6.00.

Probably the most complete and comprehensive text on this subject, from cultivation to chemical weed control, fertilization, nutrition, etc., on through to packaging and marketing.



Flower stalk about to touch glass (pane being removed)

12,111



Branched flower stalk grows far above greenhouse

12,112



Cellophane hood installed as protection against cold

12,114

WITHIN THE BROOKLYN BOTANIC GARDEN

Many plants found the past summer with its unusual dryness and excessively high temperature a bit trying—but for several desert plants in the greenhouse it proved to be a bumper season.

A variety of night-blooming *Cereus* had three flowering periods between July and October. Its spectacular funnel-shaped flowers are large, and resemble the blossom of the water lily. During each flowering period, a few to several new flowers opened nightly, about midnight, and were closed forever by 9 a.m. the following morning.

A Century Plant, *Furcraea gigantea*, found enough strength to terminate its twenty-five years in the greenhouse by pushing up a 24 foot flower stalk which bore many clusters of small yellowish green blossoms. Since the greenhouse is but 14 feet high it became necessary to remove a pane of glass so the flower stalk could grow to maturity. To protect it from sudden cold a cellophane hood was built over it. (See photos above.)

Contrary to popular belief, the Century Plant need not live 100 years before flowering. This particular species may flower in three years—or 100 years. It rarely produces seeds. It reproduces by

bulbils which are borne in the flower cluster.

In this country Century Plants are regarded mainly as ornamentals. In Mexico, where most of the species are native, they are of great economic importance as the source of sisal hemp. Intoxicating beverages are prepared from the fermented sap.

A Night-blooming *Cereus* in full flower

11,197



INDEX TO VOLUME 5

1949

An * following a page number indicates an illustration

- Abies*, 157*, 159, 169, 172, 206
Acer 150*, 153, 229
Aconite 83
Aconitum 83
 Adams, J. W., 166
Aesculus 205
African-Violet 242
Agapanthus 116, 117*, 120, 220
Ajuga 40, 47
Albizzia 216
Allium 111
 Almond 164
 "Alpine-Rose" 18, 23
Alstroemeria 120
 Althea, Shrub- 83
Alyssum 172
Amaryllis 4, 223
 Hardy, 47
Amazon-Lily 118
Amelanchier 172, 205.
Amorpha 173
Amsonia 211
Anchusa 211
Andromeda 53, 173*, 186
Anemone 118
 Apple, Crab 47
Aquilegia 211
Arabis 211
Arboretum Bulletin (University of Washington) 200
Arbor-vitae 134, 162, 171, 190
 False 190
Arbutus, Trailing 25, 29, 40
Arctostaphylos 40, 143, 144*, 173
Arctous 173
Aronia 173, 207
 Arrowhead 201
Aruncus 127, 202
Asclepias 211
 Ash 179
Asparagus 122
Asphodcline 110
 Astilbe 47, 119, 127, 202
Atamasco-Lily 118, 220
Aubrieta 208
 Avens, Mountain 178
 Avery, George S. Jr., 3, 67, 131, 154, 195
Azaleas 4, 13-63*, 125, 134, 163, 223, 242, No. 1 color*
 articles on 32
 books on 54
 cold frame for storage 39*
 culture 24, 33, 35
 diseases and pests 69
 Glenn Dale hybrid 58*
 greenhouse for forcing 39
 how to force in home greenhouse 38
 in Eastern Hemisphere 19*
 in garden 45
 in Western Hemisphere 18*
 landscape use 41*-44*
 leaf gall 62*
 low-growing companions for 40*
 planted or plunged outdoors 40*
 planting 25*
 propagation 13
Baptisia 211
 Batson, Ferris S. 35
 Barberry- 133, 173
 Bayberry 207
 Bearberry 40*, 47, 144, 173
 Beard-tongue 183
 Beech 213
Begonia 4, 47, 211, 219
Belamcanda 120
Belladonna-Lily 223
Bellflower 80*, 83-85, 126, 127*
Berberis 173
Betula 173
 Birch 82, 173
 Bishops-cap 201
 "Bittersweet, Evergreen" 135
Blackberry-Lily 120
 Bleeding-heart 211*
 Bluebeard 174
 Bluebell, Spanish 47
 Blueberry 47, 61
 Blue-Spirea 174
 Bog-Laurel 183
 Bog-Rosemary, 173*
 books, list of recent 243
 Bosley, Paul R. 33
 Botanic Garden Week 64
Bougainvillea 6
 Bowers, Clement Gray 18
 Box 41, 45, 82, 132*, 134, 174
 Brierly, Philip 98
 Brooklyn Botanic Garden
 Arthur Hoyt Scott award 128
 benefit sale of plants 128*
 Botanic Garden Week 64
 Century Plant 250*
 Ellen Eddy Shaw showing children how to pot plants 128*
 Gager memorial plaque 64
 Harriet Low Hillard fountain 192*
 harvest of the world dinner 128
 Ivy around a pool 130*
 Winter visits the Garden 194*
 Winter's blanket in the Garden No. 4 cover*
 Broom 83, 176, 179, 180*
Bruckenthalia 174
 Buckeye 205
 Buffalo-Berry 207
 Bugle-weed 40, 47
 Buttercup 202
 Buttonbush 207
 Butterwort 235
 Button-bush 239
Buxus 132*, 134, 174
 Cacti 4
Calceola 219
Calla 116, 120
 "Calla-Lily" 116, 117*, 120
Callirhoe 211
Calluna 29, 136, 139, 140*, 174
Calochortus 111, 112, 118
Caltha 201*
Calycanthus 207
Campanula 83, 84, 126, 127*
 Candytuft 181
 "Cape-Lily" 118
Caragana 174
Cardiocrinum 112-115*
 Carmel Creeper 142*
 Carnation 83, 216, 219
Caryopteris 174

- Cassia* 211
Cassiope 174
 Cat-tail 202
Ceanothus 142*, 143*, 207
Cedrus 174
Centaurea 211
 Century Plant 250*
Cephalanthus 207, 239
Cerastium 211
Cercis 204
Cereus, night-blooming 250
Chacnomeles 133, 175
Chamaecyparis 152*, 171, 175*
Chamaedaphne 176
 Checkerberry 179
 Cherry 47, 48, 187
 Cherry Blossom Queen Jean Blake 64
 Checkerberry 40
 Checkered-Lily 118
 Chinese Sacred-Lily 120
Chionanthus 205
 Choke-berry 173, 207
 Cedar of Lebanon 174
Chrysanthemums 125, 127, 208, 219, 221
 cuttings 11*, 12*
 division 11*
 spring propagation 10
 stock plants 10*, 11
Cineraria 220
 Cinquefoil 83, 186
Cladrastis 204
 Clary 85
Claytonia 202
Clethra 83, 204*, 207
 "Climbing-Lily" 120
Clintonia 201
Clivia 4
 cold frame 170*
Coleus 211
Comptonia 207
 Columbine 125
 conifers, dwarf, how to propagate 169
Convallaria 110, 111, 115, 117*, 121
 Coolwort 201
Coptis 201
 Coral-belle 40, 125
Corcopsis 211
 Cornel, Dwarf 201
 "Corn-Lily" 120
Cornus 176, 201, 205, 239
Cosmos 216
Cotoncaster 85, 132, 176*
 Cowberry 191
 Crab Apple 47
 Cranberry-bush 134, 191
 Cranesbill 83
 Crape-Myrtle 183
Crassula 4
 Creeping Jenny 200
Crinum 110, 111, 118, 223
 Crowberry 178
 Crown Imperial 116
 Crown-of-thorns 4
Cryptomeria 176
 Currant 134, 188, 239
 cuttings
 how to make hardwood 239*
 in cold frame 170*
 propagation of hardwood 238*
Cyclamen 241
Cyclocloma 192*
 Cypress 152*, 171, 175*, 205
Cyrtilla 205
Cytisus 176

Daboecia 140, 177
 Daffodil 4, 47
 Dahlia 221
 Daisy
 Painted 125
 Shasta 127
Daphne No. 3 color*, 177*
Darlingtonia 201, 237
 Day-Lily 85, 110, 115, 116*, 119*, 120, 126
 Delphinium 83, 125, 126, 211
 Desert-candles 120
Deutzia 133*, 177, 239
Dianthus 211
Dicentra 211*
Dictamnus 208
Digitalis 211
Dionaea 232*, 233*, 234
Dodecatheon 202
 Dogwood 45, 47, 48, 52, 61, 85, 125, 176, 205, 223, 239
 Douglas-Fir 187
 Dove-tree 223
Dracocephalum 126
 Dragonhead 126
Drosera 202, 233, 235*
Dryas 178
 Dustan, Alice L. 45
 dwarf Californian shrubs 142
 dwarf plants
 list 172-191
 types 131
 dwarf Rhododendrons at Seattle 145
 dwarf shrubs for low hedges 132
 dwarfs, old, in Long Island Gardens 154

Echeveria 4
Elacagnus 178
 Elder 207
 Elderberry 239
Elsholtzia 211
 Elm 61, 211
 Emsweller, S. L. 102
Empetrum 178
 English Ivy 40, 52
Epigaea 29, 40
Epimedium 40, 47
Eremurus 208
Erica 136, 137*, 138*, 139*, 178
Erigeron 127
Erodium 211
Erythronium 112, 116*-118
Eucharis 118
Euonymus 40, 134*, 178, 239
Euphorbia 4, 240*
 "Evergreen Bittersweet" 135
 Everitt, Samuel A. 55

 "Fairy-Lily" 118
 False-Cypress 171
 False-Indigo 173
 False-Spirea 85
Ficus 239
 Fig 239
 Fillmore, Richard H. 169
 Fir 157*, 159, 169, 172, 206
 Flag 200*
 Flemer, William, III 29
Flower Grower 196, 208
 Flowering Moss 187
 Forget-me-not 47, 200, 219
Forsythia 46, 48, 179, 239
Fothergilla 179, 206, 207*
 foundation planting 161, 162*, 163*
 Fox, Helen M. 80, 218
 Foxglove 84
 "Foxtail-Lilies" 120
Franklinia 206
Fraxinus 179
 Free, Montague 221
 Fringecup 201
 Fringe-tree 205
Fritillaria 110-113*, 116, 118
 Fritillary 110
 Fuchsia 220
Furcraea 250

 Gager memorial plaque 64
 garden, a sky, grows in Brooklyn 215
 garden, backyard 225*
Garden Club of America, Bulletin of the 224
 garden
 enlarging 122
 plan 122*, 123*
 garden, roof 215*, 216*, 217*
 garden, small terrace 228*
 Gardenia 220, 241
 gardening, with pots out of doors 218
 gardens, the place of small, in your life 224
 Garland-flower 177
Gaultheria 40, 179*
Gaylussacia 179
Genista 179, 180*

- Gentian 85
 seed bed 120*
 Geranium 4, 220
Geranium 83
 Germander 134, 190
Geum 211
Gillenia 211
 Gilman, William 229
 Ginkgo 153
Gladiolus 118
Glaucium 211
 Globe-flower 202
Gloriosa 110, 111, 115, 117*, 120
 Glory-Lily 110, 115, 117*, 120
 Goats-beard 127, 202
 Golden-Larch 187
 Golden-tuft 172
Gordonia 206
 Gum, Sour 205, 206*
 Ground-Hemlock 135
 greenhouse
 in a home 4
 authors' 5*
 Golden-bell 239
 Gold-flower 83
 Goldthread 201
Gypsophila 211

Hamamelis 206, 207*
 Hanson, Peter, of Brooklyn 108
 Hardy Amaryllis 47
 Harebell 84
 harvest of the world dinner 128
 Heath 136, 137*, 138, 139, 178
 Irish 140
 Heaths and Heathers 136
 Heath Family, Mycorrhiza in the 29
 Heather 29, 30, 136, 138, 140*, 174
Hedera 40, 52, 180
 hedges, dwarf shrubs for low 132
Halesia 204
Helianthemum 180, 211
Heliopsis 126
 Heliotrope 219
Helleborus 208
Hemerocallis 110, 111, 115, 116*, 119*, 120, 126, 211
 Hemlock 46, 47, 52, 141*, 154*, 156, 171, 191, 205
 Abbott's Pigmy 141*
 Ground- 135
Heuchera 40
Hibiscus 211
Hippeastrum 4
 Hodge, Walter Hendricks 232
 Holman, H. J. 24

 Holly 134, 160*, 181*
 Hollyhock 127
Holodiscus 202
Home Garden, The 212, 221
 Honeysuckle 26, 133, 183, 239
 White Swamp 13
 Horse-Chestnut 205
Hosta 116*, 120
 Huckleberry 25, 166*, 167*, 179
 Red 201
 unique Box 166*
 Hyacinth 4
 "Wood"- 47
Hydrangea 83, 164, 206, 242*
Hymenocallis 116*-118
Hypericum 83, 180, 202, 211, 239
 Hyssop 82

Iberis 181
 Ihrig, Herbert G. 31
Ilex 134, 160*, 181*
 Indian-Currant 239
 Indigo 181
Indigofera 181
 Inkberry 207
Iris 4, 83, 85, 125, 126, 200*, 201
 Irish-Heath 140, 177
Isatis 211
 Ivy 40, 52, 180
 around a pool 130*
Lia 120

 Jacobean-Lily 120
 Jacobs-rod 110
 "Jade Plant" 4
Jamnesia 206
 Jasmine 239
 Jasminum 239
 Jerusalem Cherry 241*, 242
 Joe-Pye Weed 88
 Johnston, J. W. 215
 Jordan, William E. 108
 Juniper 159, 160*, 171, 181, 182*, 206
Juniperus 153, 159, 160, 171, 172, 181, 182*, 206, No. 3 color

 Kafir-Lily 4
 Kalanchoe 242
Kalmia 47, 182
 Kammerer, E. L. 203
Kerria 239
Korolkowia 112, 113*

Lagerstroemia 183
 Lamb-kill 182
 Lantana 4
 Laurel, Mountain 29, 30, 47-49, 51, 54, 60, 61

 Laurie, Alex 212
 Lavendar-Cotton 189
Lavandula 220
Lavatera 127
 Lavender 82, 134, 220
 Lawrence, George H. M. 110
 layering 169*
 Lead-plant 173
 Leather-leaf 176
 Leatherwood 205
 "Lemon-Lily" 120
 Lemon tree 4
Leucothoe 30, 47, 49, 53
Liatris 208
Ligustrum 133, 183, 239
 Lilac 49, 62, 239
 Lily 4, 47, 68*-118, 125, 126, 163, 211, No. 2 cover*, No. 2 color
 Amazon- 118
 Atamasco- 118
 Blackberry- 120
 bulb 93*, 110
 bulblets 94*
 "Calla"- 116, 117*, 120
 Checkered- 118
 Chinese Sacred- 120
 "Climbing-" 120
 "Corn-" 120
 crosses 105
 Day- 85, 110, 115, 116*, 120, 126
 diseases in 98
 "Fairy-" 118
 Foxtail- 120
 flower 112*, 115*
 flower for breeding 102*, 103*
 Glory- 110, 115, 117*, 120
 Jacobean- 120
 Kafir- 4
 "Lemon-" 120
 Mariposa- 111, 112, 118
 bulb 113*
 motive, Crete 96*
 nectar gland 113*
 -of-the-Nile 116, 117*, 120
 -of-the-valley 40, 110, 115, 117*, 121
 "Peruvian-" 120
 "Peruvian Swamp-" 118
 Plaintain- 116*, 120
 scales 94*
 seed flat 95*
 Spider 116*, 118
 Sword- 118
 Trout- 112, 116, 117*, 118
 Water- 121*, 125
 What is a? 110
 Lilies 66*, 80*, 81*, 97*
 articles on 72
 books on 109
 for the rock garden 85

- garden pictures with 80
guide to blooming dates
106-107*
how to breed new 102
how to grow 68
native distribution maps
73*
new garden 86
propagating 93
reliable, for the garden 74
wild, of the eastern U. S.
90
Lilium 66*, 69*, 71*, 74*,
75*-78*, 81*-85*, 89*-
92*, 94*, 95*, 98*, 101*,
105*, 115*, No. 2 cover*,
color*
Limncharis 200
Link, Conrad B. 38, 118
Lobelia 211
Locust 213
Long Island estates, tour of
64
Lonicera 133, 183, 239
Lotus, Indian 222
Lungwort 47
Lupine 126
Lycoris 47
Lysimachia 200, 211
Lythrum 127, 211
- Mac Andrews, A. H. 6
MacDaniels, L. H. 90
Macneil, Alan 86
Madonna of the Lilies 97
Madwort 172
Magnolia 205
Mahonia 183, 206
Maidenhair-tree 153
Mallow, Tree- 127
Malva 211
Manzanita 143, 144*
Maple 150, 230*
mystery tree 229
Marigold, marsh- 201*
Marguerite 219
Mariposa-Lily 111, 112, 118
bulb 110*
nectar gland 113*
Marsh-Marigold 201*
Mertensia 211
Miner's Lettuce 202
Mitella 201
Mock-Orange 49, 164, 239
Monkey-flower 201
Montia 202
Morrison, B. Y. 58
Morton Arboretum Bulletin of Popular Information 203
Morus 159*, 239
Mott, William Penn, Jr. 149
Mountain Avens 178
Mountain-Laurel 29, 30, 47-
49, 51, 54, 60, 61, 183
Muchlenbeckia 183
Mulberry 159*, 239
Mulligan, B. O. 145
mycorrhiza in the heath
family 29*, 30*
Myosotis 200, 211
Myrica 207
Myrtle, Running- 47
- Narcissus* 40, 47, 110, 120
Nasturtium 211
Natural History 232
Nature Magazine 229
Naumburg, Robert E. 4
Naumburg, Sophia 4
Nelumbium 222
Nepeta 85, 126
Nerisusia 206
New-Jersey-Tea 207
New York Botanical Garden, Journal 218
Ninebark 184, 207, 239
Nomer, John B. 172
Nomocharis 112-114*
Nordine, Roy M. 238
Notholirion 112-115*
Nyssa 205, 206*
Nymphaca 121*
Nymphoides 200
- Oak 46, 54, 55, 187, 205
Ocean Spray 202
Old Man's Beard 205
Oleander 220
"Olive, Sweet" 4
Onion 111
Orange, Mock- 49
Orange tree 4
Oregon-grape 183
Osmanthus 4
Oxydendrum 47, 49, 205
- Pachistima* 40, 85, 135, 183,
203*, 206
Pachysandra 40
Pagoda-tree, 158*, 160
Painted Daisy 125
panicle 191*
Pansy 125, 219
Parker, John C. 50
Passiflora 6
Passion-flower 6
Patrinia 211
Pearce, Rex D. 208
Pea-tree 174
Peony 85, 122, 125, 126
Penstemon 183
Peperomia 241
Pepperbush 204*
Perennials from seed, it's
smart to raise your
hardy 208*
Periwinkle 40, 47
- Pernettya* 184
"Peruvian-Lily" 120
"Peruvian Swamp-Lily" 118
Petrophytum 184
Petunia 211, 219
Philadelphus 164, 184, 239
Phlox 40, 125, 127
Phyllodoce 184
Physocarpus 184, 207, 239
Picea 157*, 159, 164*, 165*,
169, 184, 185, 206
Pieris 30, 47, 48, 51, 53, 60,
82, 186
Piggyback Plant 201
Pigweed 192*
Pine 26, 29, 41, 42*, 135,
151*, 153, 155*, 156*,
157, 158, 171, 186, 206,
No. 3 cover
Pinc-barren Beauty 187
Pink 125
Pinguicula 235
Pinus 135, 151*, 153, 155*,
157, 158, 171, 186, 206
Pinxter-flower 13, 36*, 49,
55
Pitcher-Plant 201, 234*-237*
Plantain Lily 116*, 120
planting, along a path 227
plants
carc of gift, in the house
240
carnivorous 232
neglected American 203
well known, in American
gardens 207
potted, on terrace 219*,
220*
waterside 200
what makes one hardy 221
Platycodon 211
Poinsettia 240*, 241
Point Reyes Creeper 142,
143*
Polemonium 211
Poppy 211
Poplar 239
Pomegranate 153
Populus 239
Potentilla 83, 186, 211
Prairie Rose 207
Preston, Isabella 126
Primrose 47
Primula 202, 208
Privet 133, 139, 183, 216
pruning 214*
Prunus 164, 187
Pseudolarix 187
Pseudotsuga 169, 206
Pulmonaria 47
Punica 153
Pyrethrum 127
Pyxidanthra 187
Pyxie 187

- Quercus* 187, 205
 Quince, Japanese 133, 175
- raceme 191*
- Raspberry 122, 206
- Red bud 204
- Rehder, Alfred 165
- Rhododendron* 2*, 13*-63,
 134, 146*, 148*, 163, 187,
 188
 articles on 32
 at the Brooklyn Botanic
 Garden 2*
 books on 54
 branch for single-leaf cut-
 tings 16*
 classification 18
 culture 24
 in the Pacific Northwest
 31
 fundamentals 33
 Dexter hybrid 55
 diseases 60
 distribution and classifica-
 tion 18
 in Eastern Hemisphere
 (map)*
 in garden 45
 in Western Hemisphere
 (map)*
 lace bug injury 60*
 landscape use 41*-44*
 layering 15*
 leaf cuttings 17*
 leaf—iron deficiency 61*
 leaves rolling 48*
 low-growing companions
 for 40*
 naturalized 50
 pests and diseases 60
 plant from leaf cutting 17*
 planting 25
 propagation 13
 stem cutting 16*
 winter protection 26*
Rhododendrons, dwarf, at
 Seattle 145
- Ribes* 134, 188, 239
- Roberson, Frances Kinne 200
- Robinia* 207
- Robinson, Philip Luther 122
- Rock-Spirea 206
- Rosa* 188, 197, 207
- Rose 83, 122-125, 163, 196,
 199*, 216
 "Alpine-" 18, 23
 Bay 13, 14*, 18, 20*, 22*,
 30, 45, 51
 bed-organic matter 8*
 bush with winter protec-
 tion 7*
 bush, straw removed 7*
 garden, spring care 6
 Sun- 83
 Rose garden, small 224*
- Rose 188
 of Sharon 180, 221, 223
- Rosemary, Bog- 173*
- Roses, find space for more
 climbing 196
- Roses, list of climbing 199
- Rubus* 206
- Rudbeckia* 211
- Ruff, Marion E. 110
- Running-Myrtle 47
- St. Johnswort 83, 180, 202,
 239
- Saintpaulia* 242
- Sage 82, 83, 84
- Sagittaria* 201
- Salix* 188, 239, No. 3 color
- Salvia* 83, 84, 220
- Sambucus* 202, 207, 239
- Sand-Myrtle 183
- Santolina* 189
- Sarcococca* 189
- Sarracenia* 234*-237*
- Sarraceniaceae 235
- Savory, Winter 82
- Saxifraga* 208
- Scilla* 47
- Scott, Arthur Hoyt, award
 128
- Scott, Ernest L. 10
- Scutellaria* 211
- Sedge 90
- seedlings, *Oenothera* 209*
- Sequoia* 223
- Shadblow 205
- Shasta Daisy 127
- Shaw, Ellen Eddy, showing
 children how to pot
 plants 128*
- Sheep-Laurel 182
- Shepherd, Roy E. 196
- Shepherdia* 207
- Shooting-star 202
- Shrub-Althea 83
- shrubs, dwarf Californian
 142
- shrubs, dwarf, for low hedges
 132
- Silene* 211
- Silk-tree 216
- Silver-bell 204
- Sisyrinchium* 202
- Skinner, Henry T. 13
- Slate, George L. 68, 74, 105
- Snapdragon 211
- Snowberry 202, 239
- snow, winter protection 223*
- Snow-wreath 206
- Solanum* 241
- Sophora* 158*, 160
- Sorbaria* 85
- Sorrel-tree 205
- Sour-wood 47, 49
- Spanish Bluebell 47
- Speedwell 126
- Spider-Lily 116*-118
- Spike-Heath 174
- Spiraea* 127, 189, 202, 239
- Spiraea* 189
 False- 85
- Sprekelia* 120
- Spring Beauty 202
- Spring-scent 206, 207
- Spruce 26, 157*, 159, 164,
 165*, 169, 171, 184, 185,
 206
 a handsome dwarf 164*
 Colorado, compact form
 165*
- Stapelia* 4
- Starker, Carl 136
- Steeplebush 202
- Stewartia* 206
- Stokesia* 211
- Strawberry 122
- Strawberry-bush, Running
 178
- Stuart, Neil W. 93
- Sundew 202, 233, 235
- Sun-Rose 83, 180
- Sutcliffe, Alys 240
- Swamp Honeysuckle, White
 13
- "Sweet Olive" 4
- Sweet-Fern 207
- Sweet Shrub 207
- Sweet William 40, 83
- Sword-Lily 118
- Symphoricarpos* 189, 239
- Syringa* 239
- Tamarisk 239
- Tamarix* 239
- Taxodium* 205
- Taxus* 135*, 156*, 158*, 171,
 190
- Teaberry 179
- Tellima* 201
- Teucrium* 134, 189, No. 3
 color
- Teuscher, Henry 141, 161,
 164
- Thalictrum* 211
- Thermopsis* 208
- Thyme 82
- Thuja* 134, 171, 190
- Thujopsis* 190
- Tiarella* 201
- Tibouchina* 220
- Tolmiea* 201
- Tradescantia* 211
- Trailing Arbutus 25, 29, 40
 tree doctor, when to call the
 212
- Tree-Mallow 127
- trees, artificially dwarfed 149
- Tribune, New York Her-
 ald** 215
- Trillium* 47, 202
- Trollius* 202, 208

- Trout-Lily 112, 116*-118
Tsuga 141*, 154*, 171, 190, 205
Tsusioophyllum 191
 Tulip 4, 112, 115, 125
Tulipa 1*, 65*, 112, 115, 129*, 193
 Tulip-tree 211
 Tumbleweed 192*
 Tupelo 205
Typha 202

 umbel 191*

Uaccinium 191, 201
 Van Rensselaer, Mawnsell 142
 vase, ancient Cretan, based on the form of a Lily 96

 Venus Fly-trap 232*, 233*, 234
Veronica 119*, 126, 211
Viburnum 134, 191, 206, 207
Vinca 40, 47, 211
Viola 85, 216
 Violet 219
Vitex 83

 Water-Lily 121*, 125
 Water Poppy 200
 Water Snowflake 200
 Weigela 239
 Wellington Adoration 97
 Westcott, Cynthia 60
 White Swamp Honeysuckle 13
 whorl 191*
 Willow 188-189, 239

 Winterberry 179
 Wintergreen 40, 47
 Wire-plant 183
 Witch-Hazel 206, 207*
 Withe-rod 191
 "Wood-Hyacinth" 47
 Wright, Richardson 225
 Wyman, Donald 132

 Yellow-tuft 172
 Yellow-wood 204
 Yew 46, 124, 135*, 156*, 158*, 171, 190

Zantedeschia 116, 117*, 120
Zelkova 153
Zephyranthes 118, 220
Zinnia 216
Zygadenus 220

ORDER BINDERS NOW—To insure that all your copies of **PLANTS & GARDENS** are kept in good condition, and readily available.

1 Binder: \$1.00

2 Binders: \$1.75

Send check to: Brooklyn Botanic Garden
 Brooklyn 25, N. Y.

PLANTS & GARDENS is worth preserving. . . . In one year you receive:

Some 170,000 words—information about hundreds of kinds of ornamental plants.

More than 200 black and white illustrations.

20 pages of full color—with approximately 30 different kinds of plants and gardens.

BROOKLYN BOTANIC GARDEN

Scientific, Educational, and Administrative Staff

GEORGE S. AVERY, JR., Ph.D.	.....	<i>Director</i>
MATTHEW A. BASSITY, B.A.	.....	<i>Curator of Public Information</i>
MARY ANN BEAVER	.....	<i>Instructor</i>
RALPH CURTISS BENEDICT, Ph.D.	.....	<i>Investigator (Ferus)</i>
LINDSAY M. BLACK, Ph.D.	.....	<i>Curator of Plant Pathology</i>
MYRON K. BRAKKE, Ph.D.	.....	<i>Research Associate</i>
LAURA M. BREWSTER	.....	<i>Secretary</i>
LOUIS BUHLE	.....	<i>Custodian and Photographer</i>
MICHAELINA LE FRERE CARROLL	.....	<i>Instructor and Assistant Editor</i>
RALPH H. CHENEY, Sc.D.	.....	<i>Investigator (Economic Plants)</i>
FRANCES A. DÄMM, B.A.	.....	<i>Assistant Secretary</i>
WILLIAM DURKIN	.....	<i>Curatorial Assistant</i>
ELMA EDSON, A.M.	.....	<i>Curatorial Assistant</i>
CONSTANCE P. ELSON, B.A.	.....	<i>Secretary to the Director</i>
ARTHUR HARMOUNT GRAVES, Ph.D.	.....	<i>Curator Emeritus</i>
OLGA GULBIS	.....	<i>Assistant Librarian</i>
ALFRED GUNDENSEN, Docteur de l'Université (Paris)	.....	<i>Curator Emeritus</i>
E. WINIFRED HADDOCK, A.B.	.....	<i>Assistant Curator of Instruction</i>
LESLIE W. P. HARRIS, B.A.	.....	<i>Special Assistant</i>
WILLIAM E. JORDAN, B.S.	.....	<i>Librarian</i>
ROSEMARIE MAROTTA	.....	<i>Assistant Secretary</i>
FRANCES M. MINER, M.A.	.....	<i>Curator of Instruction</i>
FAY D. MONTROSS	.....	<i>Secretary and Accountant</i>
ESTELLE MOONEY	.....	<i>Assistant Secretary</i>
LOUIS G. NICKELL, Ph.D.	.....	<i>Research Associate</i>
GEORGE M. REED, Ph.D.	.....	<i>Curator Emeritus</i>
HESTER M. RUSK, A.M.	.....	<i>Instructor and Assistant Editor</i>
MARIE R. SACCO	.....	<i>Assistant Secretary</i>
ELLEN EDDY SHAW, M.A.	.....	<i>Curator Emeritus</i>
ALYS SUTCLIFFE	.....	<i>Acting Horticulturist</i>
SHIRLEY S. TEITELBAUM, M.A.	.....	<i>Research Assistant</i>
ELIZABETH REMSEN VAN BRUNT	.....	<i>Honorary Curator of Culinary Herbs</i>
WILMA R. WESCOTT, B.S.	.....	<i>Ellen Eddy Shaw Fellow</i>
LANDON H. WINCHESTER	.....	<i>Assistant Horticulturist</i>
TERESA M. ZERVAS	.....	<i>Assistant Secretary</i>

Back Issues of PLANTS & GARDENS

Each One A Classic

Back issues may be obtained at 60¢ each, except for those that are in scarce supply; these are available at \$1 a copy (*). Some issues are out of print (†).

Address mail orders to The Brooklyn Botanic Garden, Brooklyn 25, N. Y.

†Shrubs for Special Uses	Spring	} 1945
†Water Lilies and Water Gardens	Summer	
†Chrysanthemums, Knee Gardens and Plant Cancers	Autumn	
†Digest of Year's Best Garden Articles	Winter	

Trees for Special Uses	Spring	} 1946
†Roses, Wall Gardens, Embryo Culture	Summer	
†Wild Flowers—Conservation and Garden Culture	Autumn	
*Digest of Year's Best Garden Articles	Winter	

*Heath Family, from Blueberries to Azaleas	Spring	} 1947
General Issue, mostly about Perennials	Summer	
Bulbs for Autumn Planting	Autumn	
Digest of Year's Best Garden Articles	Winter	

†Iris, Hardy Plants for Cool Climates, Poles, Wild Flowers	Spring	} 1948
†Summer Gardens, Bulbs for Summer Wreath, Propagation	Summer	
†General Issue, mostly about Perennials	Autumn	
Digest of Year's Best Garden Articles	Winter	

Rhododendrons and Azaleas—Propagation and Culture	Spring	} 1949
Lilies—Kinds and Culture; Use in the Garden	Summer	
Dwarf Trees and Shrubs—for Collectors and Amateur Gardeners	Autumn	

The Botanic Garden is anxious to obtain copies of out-of-print issues and will pay \$1 each for those in good condition.

